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Kinetix 6000 Multi-Axis Servo Drive

(Catalog Numbers
2094-AC05-MP5, -AC05-M01, -AC09-M02
-AC16-M03, -AC32-M05
2094-BC01-MP5, -BC01-M01, -BC02-M02
-BC04-M03, -BC07-M05

2094-BC01-MP5-S, -BC01-M01-S,
-BC02-M02-S, -BC04-M03-S, -BC07-M05-S

2094-AMP5, -AM01, -AM02, -AM03, -AM05
2094-BMP5, -BM01, -BM02, -BM03, -BM05

2094-PRS1, -PRS2, -PRS3, -PRS4, -PRS5,
-PRS6, -PRS7, -PRS8
2094-PR1, -PR2, -PR4, -PR6, -PR8

2094-PRF

2094-AL09, -AL75S
2094-BL02, -BL75S
2094-XL75S-C1
2094-XL75S-C2

2094-BSP2)

Integration Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary we use notes to make you aware of safety considerations.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:

- identify a hazard
- avoid a hazard
- recognize the consequence

SHOCK HAZARD

Labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

BURN HAZARD

Labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be dangerous temperatures.

Appendix A

Interconnect Diagrams

Appendix B

Upgrade Your Kinetix 6000 Firmware

Appendix C

Integrate Resistive Brake Modules with Kinetix 6000 Drives

Appendix D

DC Common Bus Applications

Introduction

Read this preface to familiarize yourself with the rest of the manual. This preface contains the following topics:

- Who Should Use this Manual
- Purpose of this Manual
- Contents of this Manual
- Product Receiving and Storage Responsibility
- Related Documentation
- Conventions Used in this Manual

Who Should Use this Manual

This manual is intended for engineers or programmers directly involved in the operation, field maintenance, and integration of the Kinetix 6000 multi-axis servo drive with the SERCOS interface module.

If you do not have a basic understanding of the Kinetix 6000, contact your local Allen-Bradley representative for information on available training courses before using this product.

Purpose of this Manual

This manual provides the startup, configuration, and troubleshooting procedures for the Kinetix 6000. The purpose of this manual is to assist you in the integration of your Kinetix 6000 servo drive with the ControlLogix 1756-M*xx*SE SERCOS interface module or SoftLogix 1784-PM16SE SERCOS PCI card.

Contents of this Manual

Refer to the following listing for the descriptive contents of this installation manual.

Chapter	Title	Contents
	Preface	Describes the purpose, background, and scope of this manual. Also specifies the audience for whom this manual is intended.
Chapter 1	Commission Your Kinetix 6000	Provides steps to follow when configuring your Kinetix 6000, the Logix SERCOS interface module, and when applying power to the Kinetix 6000 for the first time.
Chapter 2	Troubleshoot Your Kinetix 6000	Provides diagnostic aids that help isolate problems with your drive and Kinetix 6000 removal/replacement procedures.
Appendix A	Interconnect Diagrams	Provides interconnect diagrams between the Kinetix 6000 and the Line Interface Module, Shunt Module, Resistive Brake Module and servo motors.
Appendix B	Upgrade Your Kinetix 6000 Firmware	Provides steps to follow when you need to upgrade (flash) your IAM and AM firmware.
Appendix C	Integrate Resistive Brake Modules with Kinetix 6000 Drives	Provides safety precautions, interconnect diagrams, and procedures specific to configuring the RBM with the Kinetix 6000.
Appendix D	DC Common Bus Applications	Explains how to calculate capacitance values and set the Add Bus Cap parameter for DC common bus applications.

Product Receiving and Storage Responsibility

You, the customer, are responsible for thoroughly inspecting the equipment before accepting the shipment from the freight company. Check the item(s) you receive against your purchase order. If any items are obviously damaged, it is your responsibility to refuse delivery until the freight agent has noted the damage on the freight bill. Should you discover any concealed damage during unpacking, you are responsible for notifying the freight agent. Leave the shipping container intact and request that the freight agent make a visual inspection of the equipment.

Store the product in its shipping container prior to installation. If you are not going to use the equipment for a period of time, store using the following guidelines.

- Use a clean, dry location
- Maintain an ambient temperature range of -40 to 70° C (-40 to 158° F)
- Maintain a relative humidity range of 5% to 95%, non-condensing
- Store it where it cannot be exposed to a corrosive atmosphere
- Store it in a non-construction area

Related Documentation

The following documents contain additional information concerning related Allen-Bradley products. To obtain a copy, contact your local Allen-Bradley office, distributor, or download them from www.rockwellautomation.com/literature.

For	Read This Document	Catalog Number
The instructions needed for the installation and wiring of the Kinetix 6000	Kinetix 6000 Installation Manual	2094-IN001
Installation instructions for the LIM and removal/replacement procedures for selected internal LIM components	Kinetix 6000 Line Interface Module Installation Instructions	2094-IN005
Information on wiring and troubleshooting your Kinetix 6000 safety drive	Kinetix Safe-Off Feature Safety Reference Manual	GMC-RM002
A description and specifications for the 2094 family including motors and motor accessories	Kinetix Motion Control Selection Guide	GMC-SG001
Drive and motor sizing with application analysis software	Motion Analyzer CD (v4.1 or above)	PST-SG003
Kinetix 6000 user documentation and CAD files	Kinetix 6000 User Documentation and CAD Files CD	2094-CL001
More detailed information on the use of ControlLogix motion features and application examples	ControlLogix Motion Module Programming Manual	1756-RM086
ControlLogix SERCOS interface module installation instructions	SERCOS interface Module Installation Instructions	1756-IN572
SoftLogix SERCOS interface PCI card installation instructions	16 Axis PCI SERCOS interface Card Installation Instructions	1784-IN041
The instructions needed to program a motion application	Logix5000 Controllers Motion Instructions Reference Manual	1756-RM007
Information on configuring and troubleshooting your ControlLogix SERCOS and analog motion modules	Logix5000 Motion Modules User Manual	1756-UM006
Information on configuring and troubleshooting your SoftLogix PCI card	SoftLogix Motion Card Setup and Configuration Manual	1784-UM003
Information on the installation and wiring of Bulletin 2090 Resistive Brake Modules	Resistive Brake Module Installation Instructions	2090-IN009
Information on proper handling, installing, testing, and troubleshooting fiber-optic cables	Fiber-Optic Cable Installation and Handling Instructions	2090-IN010
Information, examples, and techniques designed to minimize system failures caused by electrical noise	System Design for Control of Electrical Noise	GMC-RM001
For declarations of conformity (DoC) currently available from Rockwell Automation	Rockwell Automation Product Certification website	www.ab.com/certification/ce/docs
An article on wire sizes and types for grounding electrical equipment	National Electrical Code	Published by the National Fire Protection Association of Boston, MA.
A glossary of industrial automation terms and abbreviations	Allen-Bradley Industrial Automation Glossary	AG-7.1

Conventions Used in this Manual

The following conventions are used throughout this manual.

- Bulleted lists such as this one provide information, not procedural steps
- Numbered lists provide sequential steps or hierarchical information
- Words that you type or select appear in bold
- When we refer you to another location, the section or chapter name appears in italics
- Acronyms for the Kinetix 6000 components, shown in the table below, are used throughout this manual.

Kinetix 6000 Component	Catalog Numbers	Acronym
Power Rail	2094-PR*x*	PR
Power Rail (slim)	2094-PRS*x*	PRS
Power Rail Slot Filler	2094-PRF	PRF
Integrated Axis Module	2094-*x*C*xx*-M*xx*	IAM
Axis Module	2094-*x*M*xx*	AM
Line Interface Module	2094-*x*L*xx* and -*x*L*xx*S-*xx*	LIM
Shunt Module	2094-BSP2	SM
Resistive Brake Module	2090-XB*xx-xx*	RBM

Commission Your Kinetix 6000

Chapter Objectives

This chapter provides you with information to apply power and configure your Kinetix 6000. This chapter includes:

- General Startup Precautions
- Understand IAM/AM/SM and LIM Connectors
- Locate Connectors and Indicators
- Locate SERCOS Interface Fiber-Optic Connectors
- Configure Your Kinetix 6000
- Configure Your Logix SERCOS interface Module
- Apply Power to Your Kinetix 6000
- Test and Tune Your Axes

Note: Some of the procedures in this chapter include information regarding integration with other products.

General Startup Precautions

The following precautions pertain to all of the procedures in this chapter. Be sure to read and thoroughly understand them before proceeding.

ATTENTION

This product contains stored energy devices. To avoid hazard of electrical shock, verify that all voltages on the system bus network have been discharged before attempting to service, repair or remove this unit. Only qualified personnel familiar with solid state control equipment and safety procedures in publication NFPA 70E or applicable local codes should attempt this procedure.

ATTENTION

This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. You are required to follow static control precautions when you install, test, service, or repair this assembly. If you do not follow ESD control procedures, components can be damaged. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, *Guarding Against Electrostatic Damage* or any other applicable ESD Protection Handbook.

Understand IAM/AM Connectors

The following table provides a brief description of the Kinetix 6000 IAM/AM connectors.

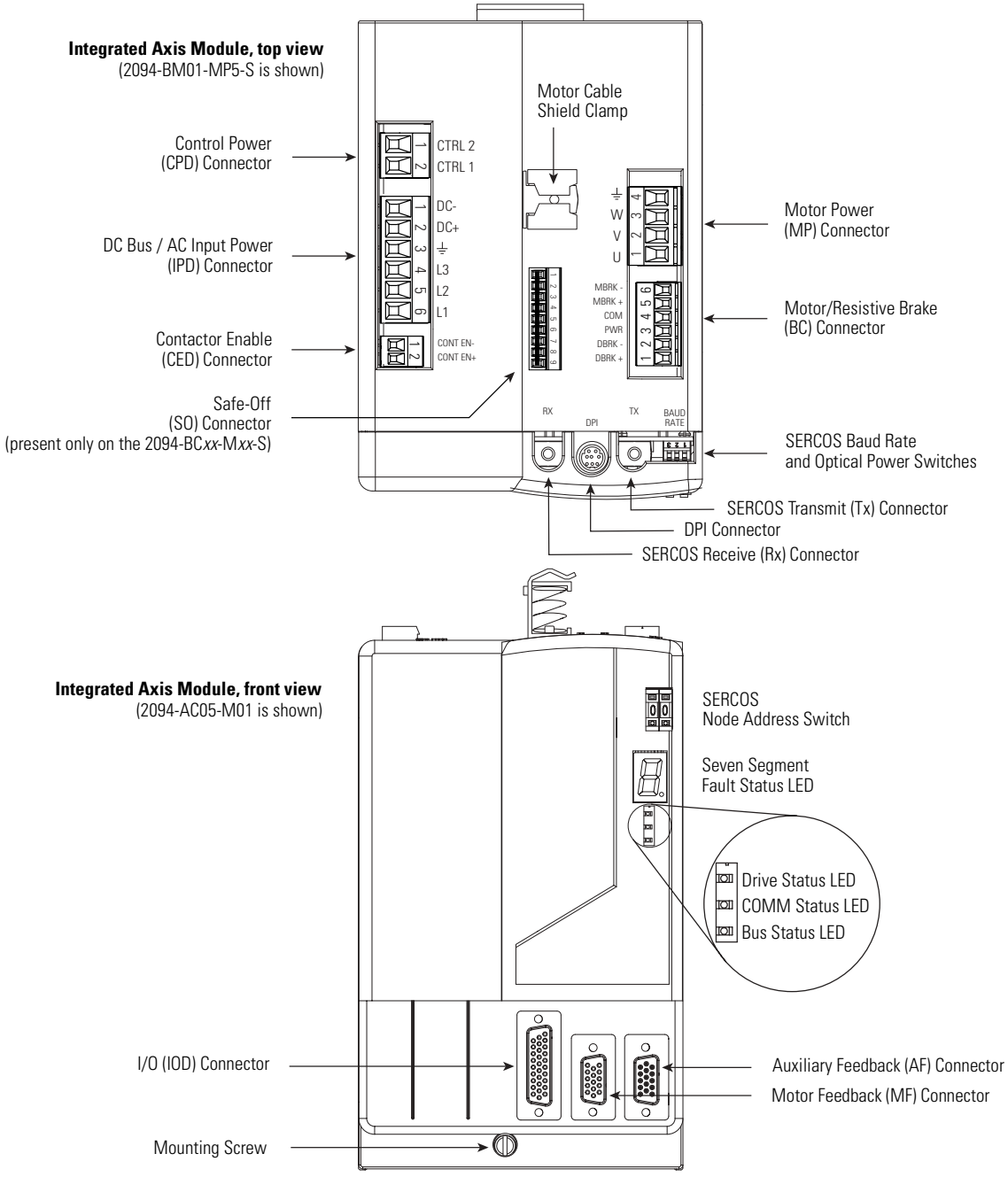
Integrated Axis Module/Axis Module Connectors

Designator	Description	Connector	Present on IAM or AM
IOD	User I/O (drive)	26-pin high-density D-shell	IAM/AM
MF	Motor Feedback	15-pin high-density D-shell (male)	IAM/AM
AF	Auxiliary Feedback	15-pin high-density D-shell (female)	IAM/AM
CPD	Control Input Power (drive)	2-position connector housing	IAM
IPD	DC Bus and VAC Input Power (drive) 230V	6-position connector housing	IAM
	DC Bus and VAC Input Power (drive) 460V	6-position connector housing	IAM
CED	Contactor Enable	2-position connector housing	IAM
MP	Motor Power	4-position connector housing	IAM/AM
BC	Resistive/Motor Brake	6-position connector housing	IAM/AM
SO	Safe-Off	9-position plug/header	IAM/AM
Tx and Rx	SERCOS Transmit and Receive	SERCOS fiber optic (2)	IAM/AM
DPI	DPI	DPI	IAM

Locate IAM Connectors and Indicators

Use the figure below to locate the Integrated Axis Module connectors and indicators. Although the physical size of the 2094-BC*xx*-M*xx* (460V) IAM is larger than the 2094-AC*xx*-M*xx* (230V) IAM, the location of the connectors and indicators is identical.

Figure 1.1
Kinetix 6000 Integrated Axis Modules (2094-AC*xx*-M*xx* and -BC*xx*-M*xx*)

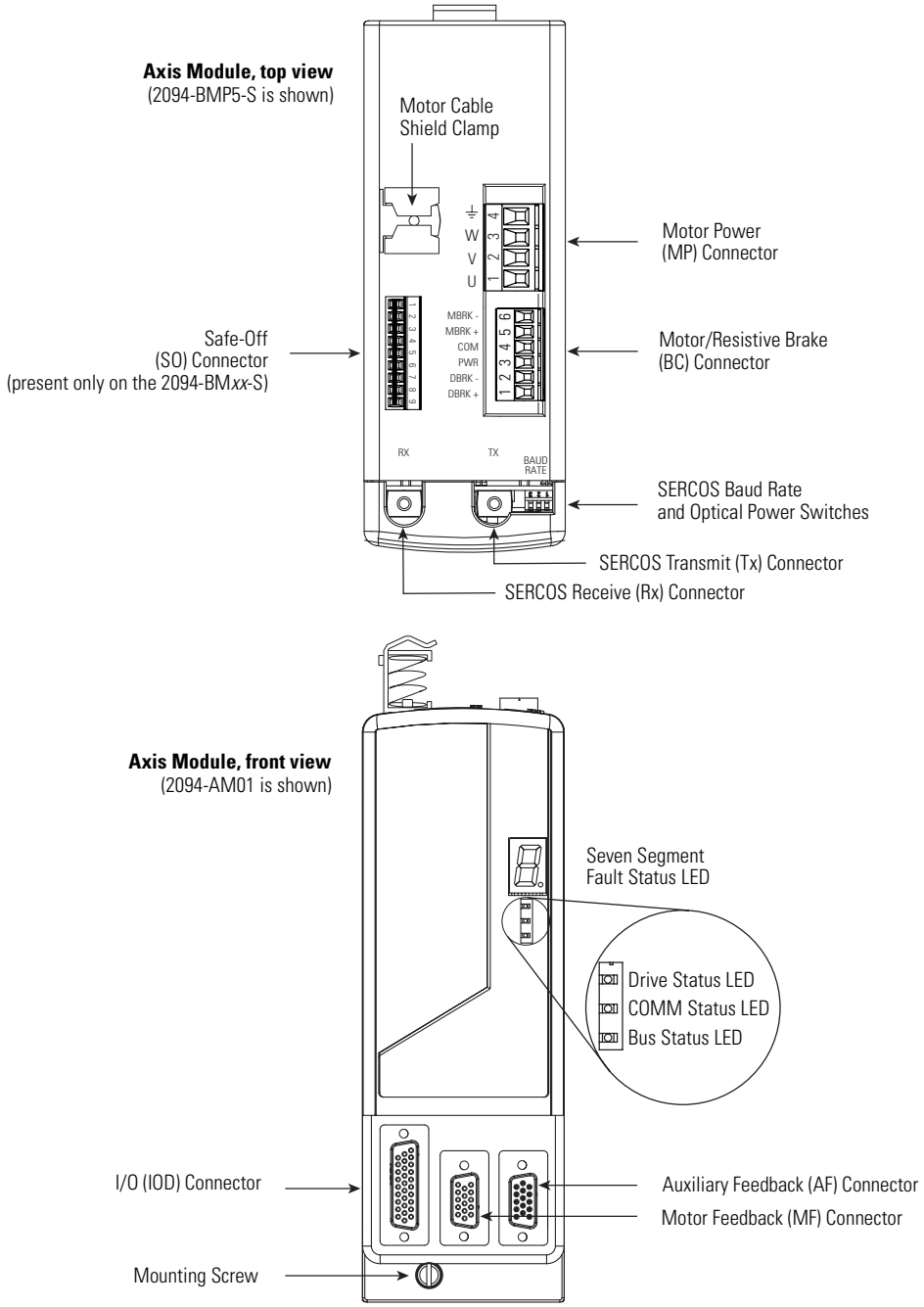


Note: Power, feedback, and I/O connectors are shown, however for wiring information, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001).

Locate AM Connectors and Indicators

Use the figure below to locate the Axis Module connectors and indicators. Although the physical size of the 2094-BM*xx* (460V) AM is larger than the 2094-AM*xx* (230V) AM, the location of the connectors and indicators is identical.

Figure 1.2
Kinetix 6000 Axis Modules (2094-AM*xx* and -BM*xx*)



Note: Power, feedback, and I/O connectors are shown, however for wiring information, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001).

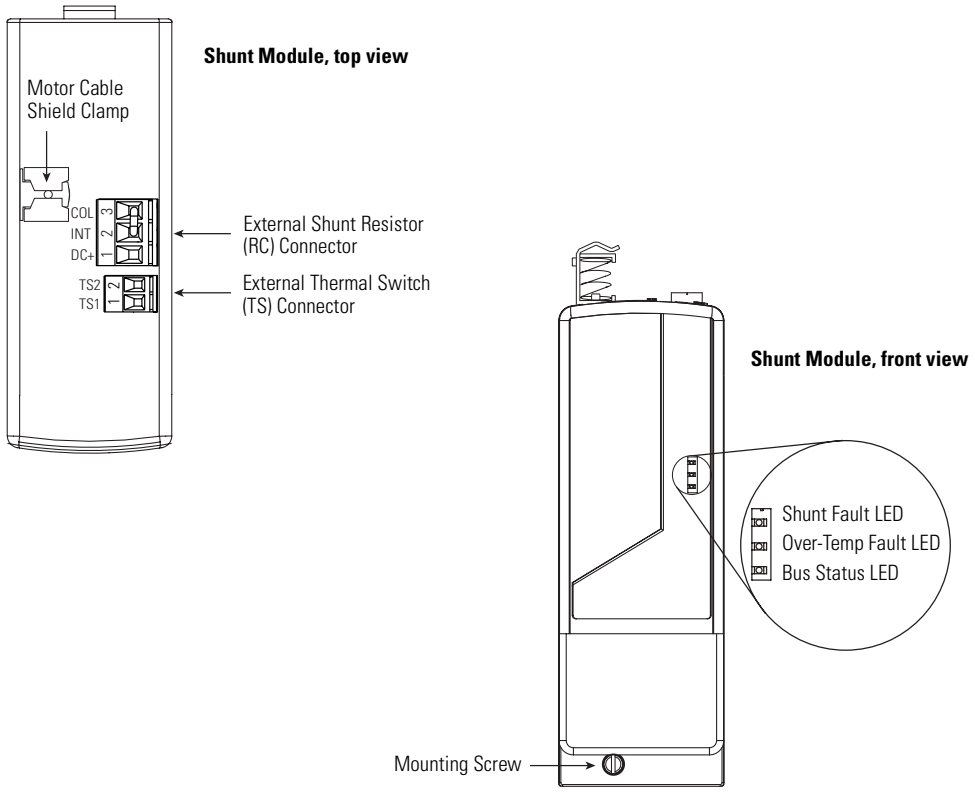
Understand SM Connectors

Use the table below and Figure 1.3 to locate the Shunt Module connectors and indicators.

Locate Shunt Module Connectors

Designator	Description	Connector
RC	External Shunt Resistor Connector	3-position connector housing
TS	External Thermal Switch Connector	2-position connector housing

Figure 1.3
Kinetix 6000 Shunt Modules (2094-BSP2)



Note: Power connectors are shown, however for wiring information, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001).

Understand LIM Connectors and Indicators

Use the tables below and figures 1.4 and 1.5 to locate the Line Interface Module connectors.

Line Interface Module Connectors

The following table describes the Line Interface Module connectors used with catalog numbers 2094-AL75S, -BL75S, and -XL75S-C*x*.

Designator	Description	Connector
IOL	Status I/O (LIM)	21-pin (plugable) terminal block
IPL	VAC LINE Input Power (LIM)	4-position plug/header
OPL	VAC LOAD Output Power	4-position plug/header
P1L	Brake and I/O Power Output (24V dc)	6-position plug/header
P2L	Auxiliary Power Output (230V ac)	4-position plug/header
CPL	Control Power Output (LIM)	2-position plug/header
APL [1]	Auxiliary Power Input (LIM)	2-position plug/header

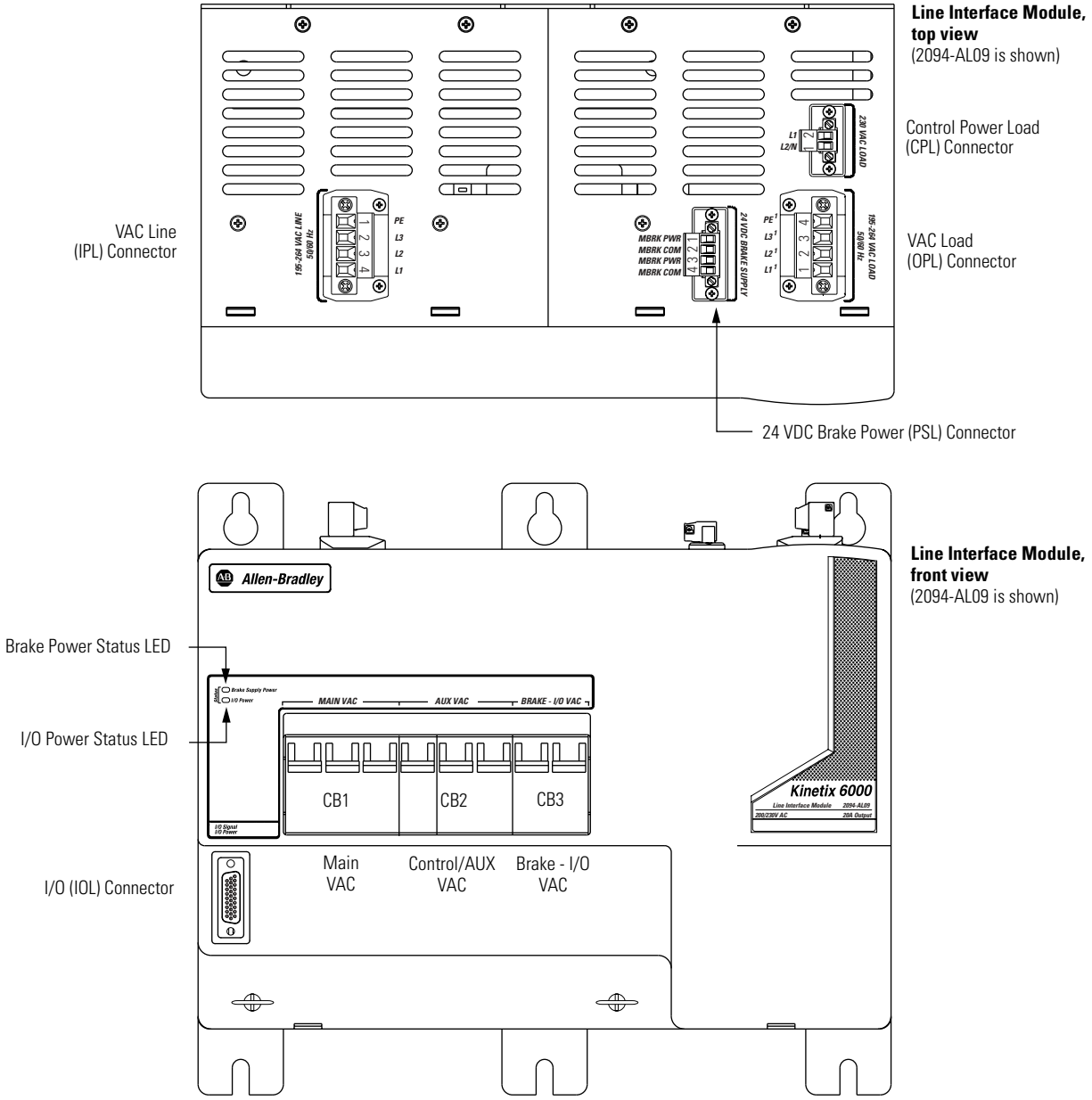
[1] Auxiliary Power Input (APL) connector is only present on the 2094-XL75S-C*x* model.

The following table describes the Line Interface Module connectors used with catalog numbers 2094-AL09 and -BL02.

Designator	Description	Connector
IOL	Status I/O (LIM)	26-pin high-density D-shell
IPL	VAC LINE Input Power (LIM)	4-position terminals
OPL	VAC LOAD Output Power	4-position terminals
PSL	Brake and I/O Power Output (24V dc)	4-position plug/header
CPL	Control Power Output (LIM)	2-position plug/header

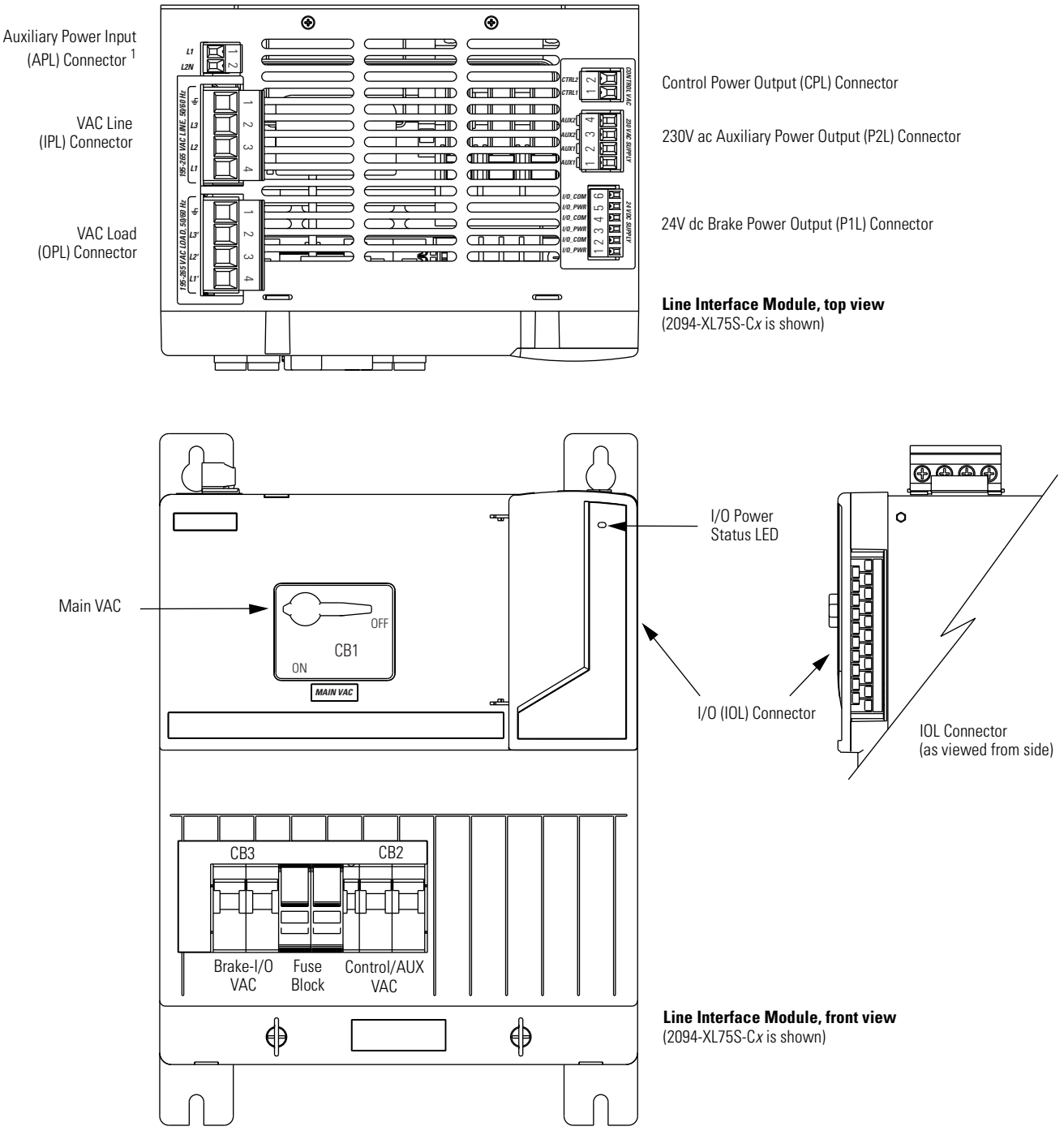
Use the figure below to locate the Line Interface Module connectors and indicators.

Figure 1.4
Kinetix 6000 Line Interface Modules (2094-AL09 and -BL02)



Use the figure below to locate the Line Interface Module connectors and indicators.

Figure 1.5
Kinetix 6000 Line Interface Modules (2094-AL75S, -BL75S, and -XL75S-C*x*)



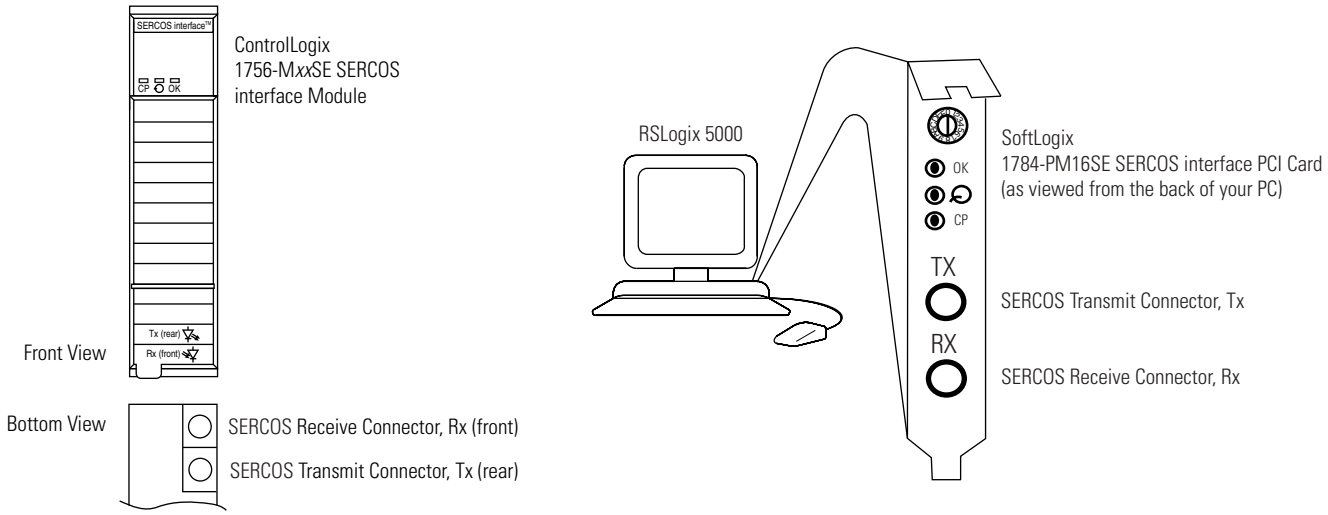
[1] Auxiliary Power Input (APL) connector is only present on the 2094-XL75S-C*x* model.

Locate SERCOS Interface Fiber-Optic Connectors

Use the figure below to locate the SERCOS interface fiber-optic connectors. The fiber-optic ring is connected using the SERCOS Receive and Transmit connectors.

Note: Plastic cable is available in lengths up to 32 m (105.0 ft). Glass cable is available in lengths up to 200 m (656.7 ft).

Figure 1.6
ControlLogix and SoftLogix SERCOS Connector Locations



Configure Your Kinetix 6000

These procedures assume you have completed mounting, wiring, and connecting your SERCOS interface module and Kinetix 6000 drive as described in the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001).

The procedures in this section apply to Kinetix 6000 drive components and describe how to:

- Configure your Kinetix 6000 IAM and AM(s)
- Configure your SERCOS interface module using RSLogix 5000 software
- Download your program to your Logix controller
- Apply power to your Kinetix 6000 drive components
- Test and tune your motor using RSLogix 5000 software

These procedures assume you have connected the fiber optic cables between your IAM (2094-*x*C*xx*-M*xx*, inverter section), axis modules (2094-*x*M*xx*), and the ControlLogix chassis with 1756-M*xx*SE interface module or personal computer with 1784-PM16SE PCI card.

Configure Your Integrated Axis Module

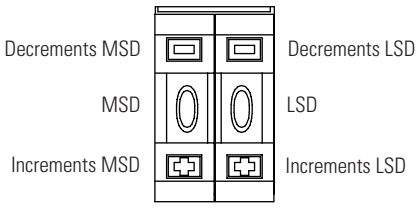
To configure your IAM:

1. Verify that there is no power applied to the IAM and that the SERCOS fiber-optic cables are plugged into the Tx and Rx connectors. To verify your fiber-optic cable connections, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001).

2. Set the base node address for the IAM by setting the SERCOS Node Address switch. Valid node addresses are 01-99. The left hand switch sets the most significant digit (MSD) and the right hand switch sets the least significant digit (LSD). Refer to the table below for switch operation. Refer to for switch location.

To	Press
Increment the (MSD/LSD) node address	The plus (+) switch.
Decrement the (MSD/LSD) node address	The minus (-) switch.

Figure 1.7
Setting the Base Address Switches



Setting the base node address on the IAM determines the node address for the IAM inverter. Node addressing for all slot locations on the same power rail increment (from the IAM inverter) left to right.

IMPORTANT After setting the base node address, always cycle control power to initialize the IAM.

IMPORTANT When two or more IAMs are connected to the same SERCOS interface module, each node address must be unique.

Refer to figures 1.9, 1.10, and 1.11 for examples of how node addresses are assigned.

Refer to Figure 1.8 for an example of the fiber-optic ring connections between the Kinetix 6000 drive(s) and the SoftLogix PCI card. Although Figure 1.8 only illustrates the SERCOS fiber-optic ring with the SoftLogix PCI card, node addressing for SoftLogix is done the same way as shown in the three ControlLogix examples.

Figure 1.8
Fiber-Optic Ring Connection

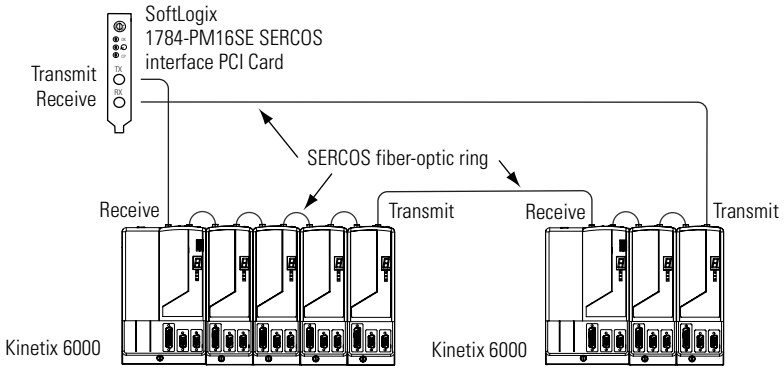
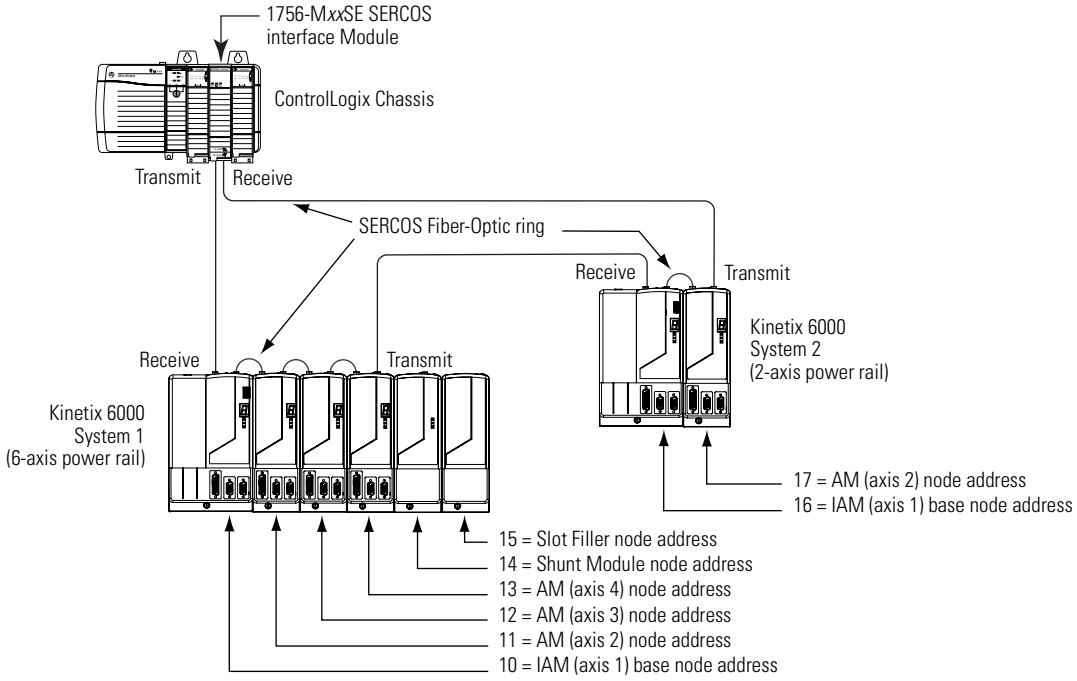


Figure 1.9
Node Addressing Example 1

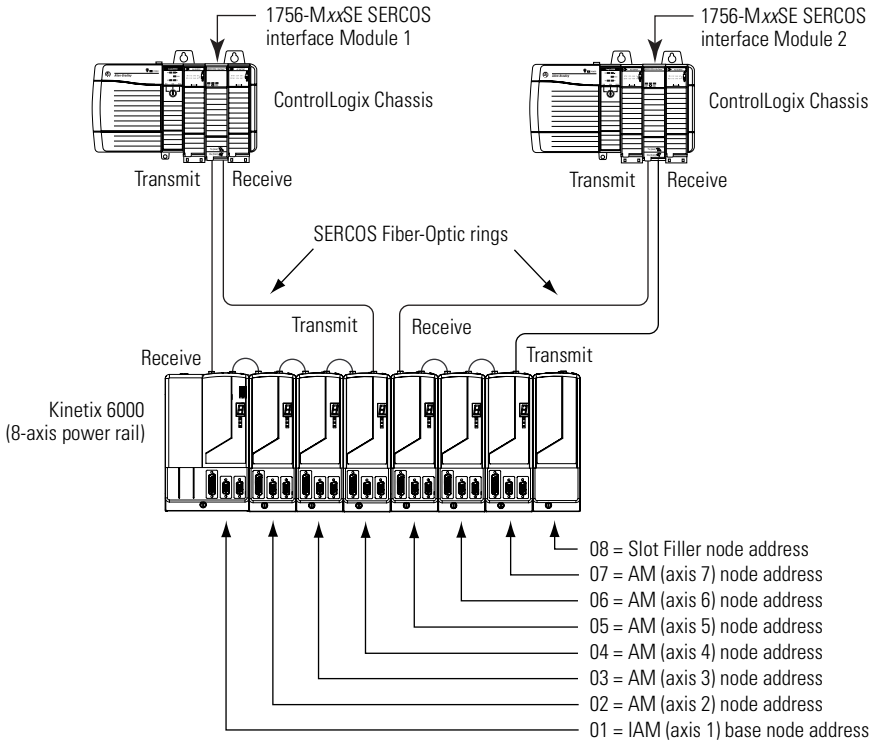


In the example above, Kinetix 6000 (6-axis) System 1 power rail contains one IAM, three AMs, one SM, and one slot filler module. The shunt module and slot filler slots are assigned a node address, but they do not use it.

Kinetix 6000 (2-axis) System 2 power rail contains one IAM and one AM. The base node address of the IAM (system 2) must be set for an address of ≥16 or ≤8.

IMPORTANT Do not position axis modules to the right of shunt or slot filler modules. The added distance between non-adjacent axes can increase electrical noise and impedance, and requires longer fiber-optic cable lengths.

Figure 1.10
Node Addressing Example 2



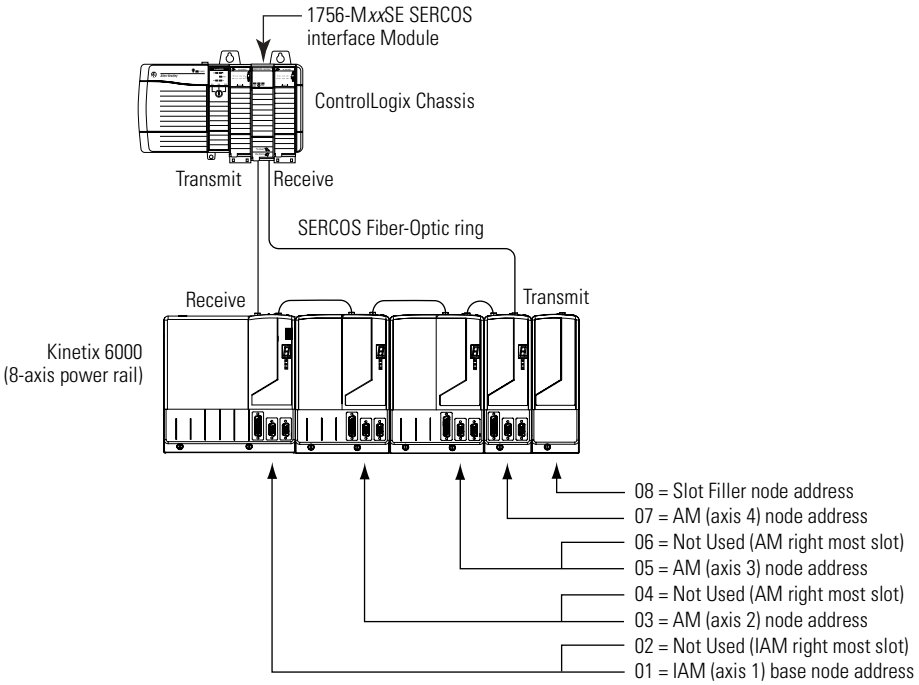
In the example above, SERCOS interface module 1 controls axes 1 to 4 and module 2 controls axes 5 to 7. The slot filler module is assigned a node address, but does not use it.

Note: You can mount the two SERCOS interface modules in two separate ControlLogix chassis (as shown above) or you can mount them in the same chassis.

Utilizing two SERCOS interface modules to control axes from a single Kinetix 6000 power rail allows you to reduce the cycle times.

IMPORTANT Slot Filler modules must be used to fill any unoccupied slot on the power rail. However, the slot fillers may also be removed and replaced by an axis or shunt module in the future.

Figure 1.11
Node Addressing Example 3



In the example above, the Kinetix 6000 (8-axis) power rail contains a double-wide IAM, two double-wide AMs, one single-wide AM, and one slot filler module. The slot filler module is assigned a node address, but does not use it.

The left-most slot of a double-wide module determines the node address. So, in the example above, node addresses 02, 04, and 06 (the right-most slots of the double-wide modules) are not used.

IMPORTANT Slot Filler modules must be used to fill any unoccupied slot on the power rail. However, the slot fillers may also be removed and replaced by an axis or shunt module in the future.

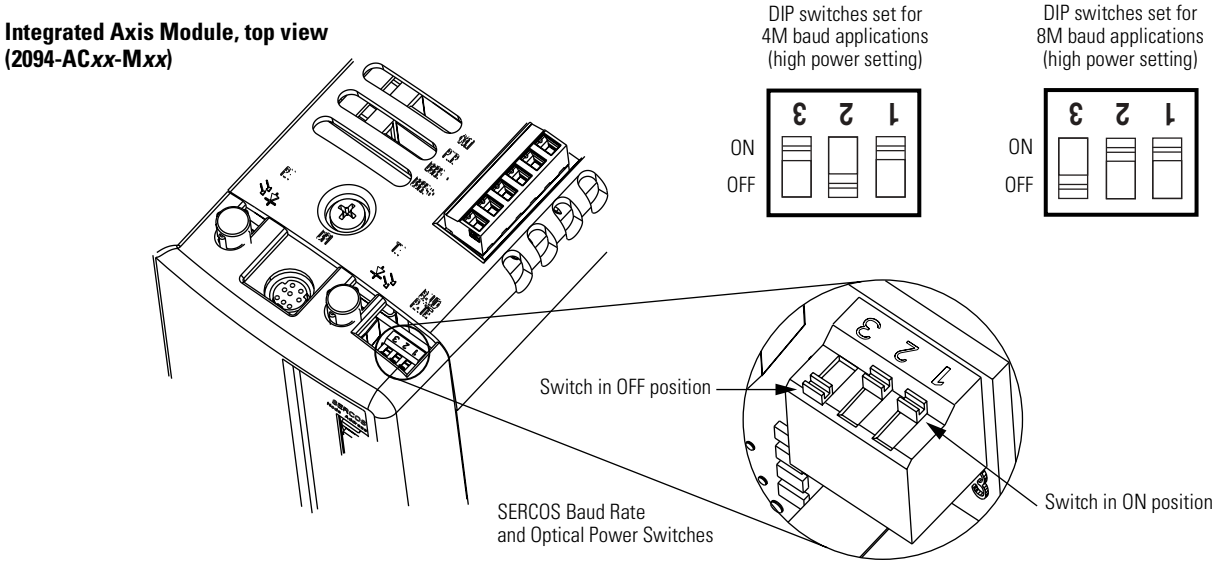
3. Set the SERCOS baud rate using DIP switches 2 and 3, as shown in Figure 1.12. Refer to the table below for baud rate switch settings.

For this baud rate	Set switch 2	Set switch 3
4M baud	OFF	ON
8M baud	ON	OFF

4. Set the SERCOS optical power level to **High** using DIP switch 1, as shown in Figure 1.12. Refer to the table below for optical power level switch setting.

For this optical power level	Set switch 1
Low	OFF
High	ON

Figure 1.12
SERCOS Baud Rate and Optical Power DIP Switches



Configure Your Axis Module(s)

This procedure assumes you have configured your IAM. Use the following procedure to configure your axis module(s). In this procedure you will set the baud rate and optical power level switches for your IAM and each AM.

IMPORTANT The node address for each axis module is determined by the base node address switch setting on the IAM. Refer to Figure 1.9.

To configure your Axis Module(s):

1. Verify that there is no power applied to the IAM and that the SERCOS fiber-optic cables are plugged into the Tx and Rx connectors. To verify your fiber-optic cable connections, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001).

2. Set the SERCOS baud rate using DIP switches 2 and 3, as shown in Figure 1.12 (page 1-14). Refer to the table below for the baud rate switch settings.

For this baud rate	Set switch 2	Set switch 3
4M baud	OFF	ON
8M baud	ON	OFF

3. Set the optical power level to **High** using DIP switch 1, as shown in Figure 1.12. Refer to the table below for optical power level switch setting.

For this optical power level	Set switch 1
Low	OFF
High	ON

Configure Your Logix SERCOS interface Module

This procedure assumes that you have wired your Kinetix 6000 system and have configured the Kinetix 6000 baud rate and optical power switches.

IMPORTANT In order for the Kinetix 6000 to communicate with the SERCOS interface module (indicated by the three LEDs on the module going solid green), your RSLogix 5000 software must be version 11.0 or above.

For greater detail on the RSLogix 5000 software as it applies to ControlLogix and SoftLogix modules, refer to the table below for the appropriate publication.

For	Refer to this Document	Publication Number
Detailed information on configuring and troubleshooting your ControlLogix motion module	Logix5000 Motion Modules User Manual	1756-UM006
Detailed information on configuring and troubleshooting your SoftLogix PCI card	SoftLogix Motion Card Setup and Configuration Manual	1784-UM003

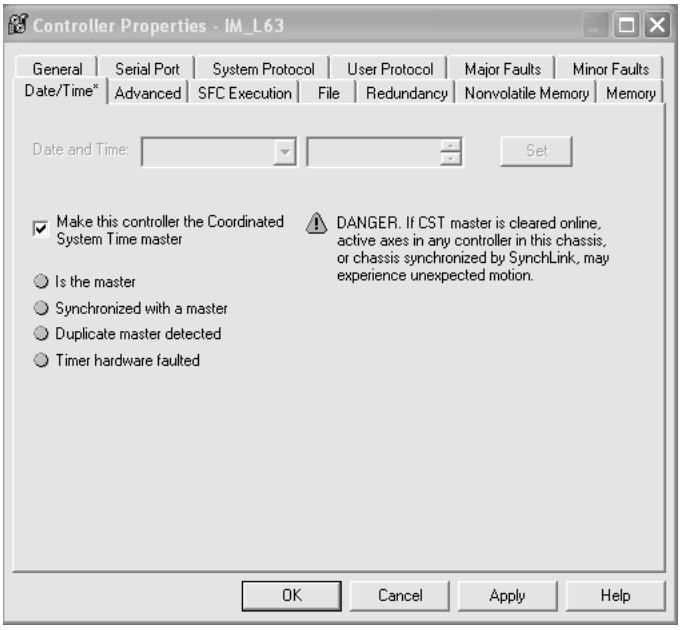
If you have already configured your Logix module using one of the setup and configuration manuals listed above, go directly to *Apply Power to Your Kinetix 6000* (page 1-26). If not, go to *Configure Your Logix Controller* beginning below.

Configure Your Logix Controller

To configure your Logix controller:

1. Apply power to your Logix chassis/PC containing the SERCOS interface module and open your RSLogix 5000 software.
2. Select **New** in the File menu. The New Controller window opens.
   - Select controller type
   - Select RSLogix 5000 revision
   - Name the file
   - Select the Logix chassis size
   - Select the Logix processor slot
3. Select **OK**.
4. Select **Controller Properties** in the edit menu. The Controller Properties window opens.

5. Select the **Date and Time** tab.



6. Check the box **Make this controller the Coordinated System Time master**.

IMPORTANT Only one ControlLogix processor can be assigned as the Coordinated System Time master.

7. Select **OK**.

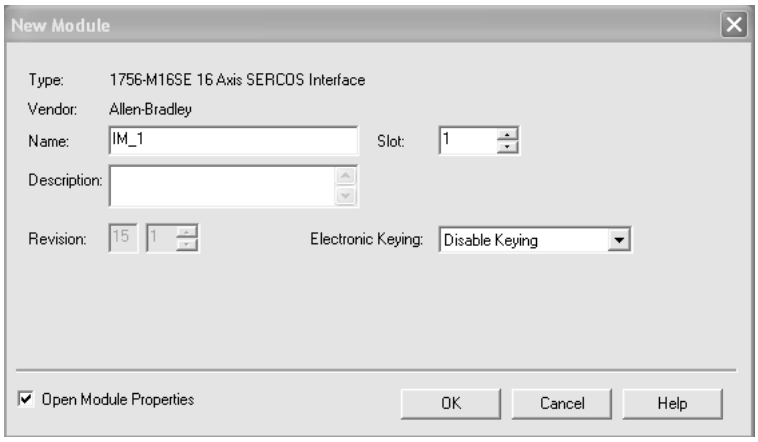
Configure Your Logix Module

To configure your Logix module:

1. Right-click on I/O Configuration in the explorer window and select **New Module**. The Select Module window opens.

2. Expand the Motion category and select **1756-M*xx*SE, -L60M03SE,** or **1784-PM16SE** as appropriate for your actual hardware configuration.

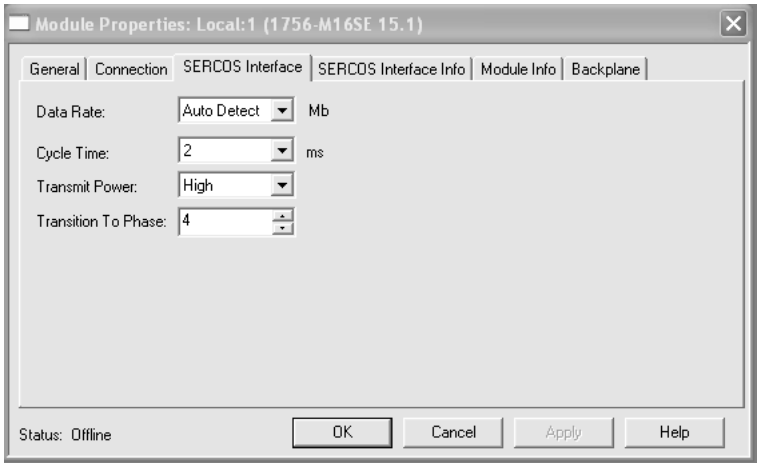
3. Select **OK**. The New Module window opens. Your new module appears under the I/O Configuration folder in the explorer window.



- Name the module
- Select the slot where your module resides (left most slot = 0)
- Select an Electronic Keying option (select Disable Keying if unsure)
- Check the box **Open Module Properties**.

4. Select **OK.** The Module Properties window opens.

5. Select the **SERCOS Interface** tab and reference the table below.



Logix SERCOS Module	Number of Axes	Data Rate
1756-M03SE or 1756-L60M03SE	up to 3	4 or 8 Mbits/s
1756-M08SE	up to 8	
1756-M16SE or 1784-PM16SE	up to 16	

6. Select **Data Rate, Cycle Time** and **Optical Power** settings.

   - Ensure the Data Rate setting matches DIP switches 2 and 3 (baud rate) as set on the IAM and AM(s), or use the Auto Detect setting.
   - Set the Cycle Time according to the table below.

Data Rate	Number of Axes	Cycle Time
4 Mbits/s	up to 2	0.5 ms
	up to 4	1 ms
	up to 8	2 ms
	No support for axes 9 to 16	
8 Mbits/s	up to 4	0.5 ms
	up to 8	1 ms
	up to 16	2 ms

   Note: The number of axes/module is limited to the number of axes as shown in step 5.

   - Ensure the Optical Power setting (high or low) matches DIP switch 1 as set on the IAM and AM(s).
   - Transition to Phase default setting is 4 (phase 4). The Transition to Phase setting will stop the ring in the phase specified.

7. Select **OK**.

8. Repeat steps 1-7 for each Logix module.

Configure Your Kinetix 6000 Modules

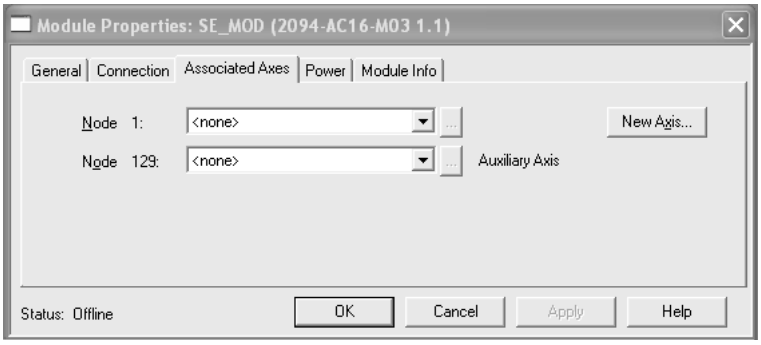
To configure your Kinetix 6000 modules:

1. Right-click on the new Logix module you just created and select **New Module**. The Select Module window opens.

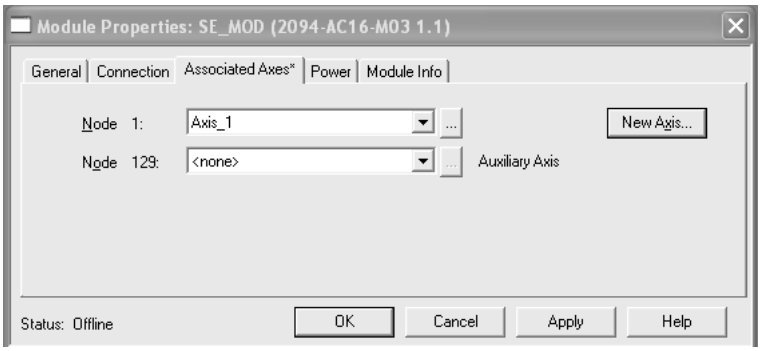
2. Select your **2094-*x*C*xx*-M*xx*** (IAM) or **2094-*x*M*xx*** (AM) as appropriate for your actual hardware configuration.

3. Select **OK**. The Module Properties window opens.
   - Name the module
   - Set the Node address

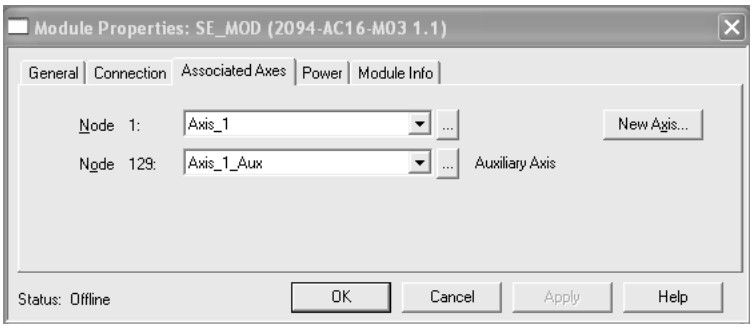
     Note: Set node address in the software to match the node setting on the drive. Refer to *Configure Your Integrated Axis Module*, step 2, on page 1-10.
   - Select an Electronic Keying option
   - Check the box **Open Module Properties**
4. Select **OK**.
5. Select the **Associated Axes** tab.



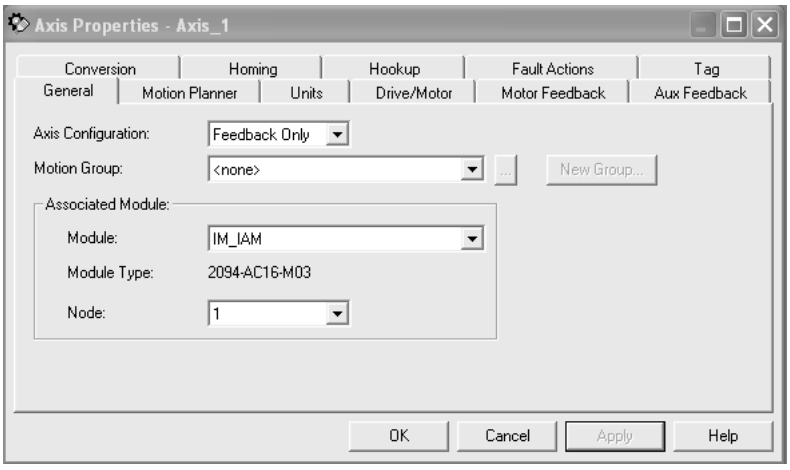
6. Select the **New Axis** button. The New Tag window opens.
   - Name the axis
   - Select **AXIS_SERVO_DRIVE** as the Data Type
7. Select **OK**. The axis appears under the Ungrouped Axes folder in the explorer window.
8. Assign your axis to the node address (as shown in the window below).



With drive firmware version 1.80 (or above) and RSLogix 5000 software version 13 (or above), it is possible to configure the auxiliary axis feedback port as a Feedback Only axis. With this feature, each IAM (inverter) or AM can be configured to appear as two axes/nodes on the SERCOS ring. The base node is the servo axis utilizing the motor feedback, and the base node (plus 128) is a feedback only axis utilizing the auxiliary feedback port (as shown below).

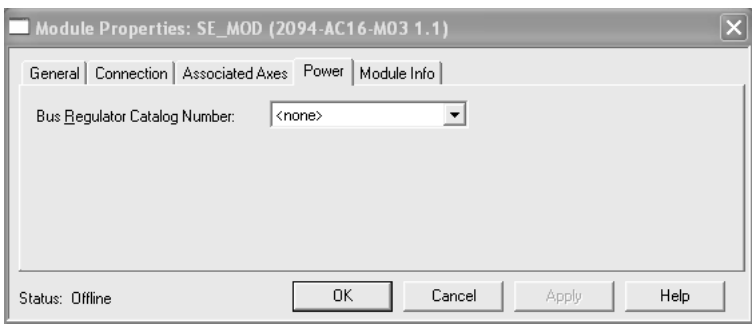


If an axis is associated to the auxiliary axis node, then the Axis Configuration on the General tab of the Axis Properties page is set to *Feedback Only* (as shown below).



9. Select **OK**.

10. Select the **Power** tab.



11. Select the Bus Regulator Catalog Number or other as appropriate for your actual hardware configuration.

If your IAM is	And your hardware configuration includes this shunt option	Then select
Configured as an IAM or Leader IAM (common bus) [1]	Internal shunts only	Internal or <none>
	Bulletin 2094 (rail mounted) shunt module	2094-BSP2
	Bulletin 1394 passive shunt module (connected to the 2094-BSP2)	1394-SR*xxxx*
	Bulletin 1336 active shunt module	Internal or <none>
Configured as a Follower IAM [2]	N/A. Shunts are disabled on Follower IAM	CommonBus Follow

[1] Drive will not accept Internal, <none>, 2094-BSP2, or 1394-SR*xxxx* selection if DC Bus voltage is present without having three-phase power applied.

[2] Drive will not accept CommonBus Follow selection if three-phase power is applied.

ATTENTION

To avoid damage to your Bulletin 1394 external shunt module, verify that the proper 230V or 460V fuse is installed prior to applying power. Refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Instructions* (publication 2094-IN001) for fuse specifications.

IMPORTANT

When configured to use the Bulletin 1394 or 2094 shunt modules, the IAM bus regulator capacity attribute displays the shunt module or passive shunt module utilization instead of the IAM internal shunt resistor utilization.

IMPORTANT

DC Common Bus applications must calculate Total Bus Capacitance and Additional Bus Capacitance and set the Add Bus Cap parameter (*x:x:x*599) using DriveExplorer software. Refer to *Appendix D* for the procedures.

12. Select **OK**.

13. Repeat steps 1-9 for each 2094-*x*M*xx* Axis Module (AM).

Configure the Motion Group

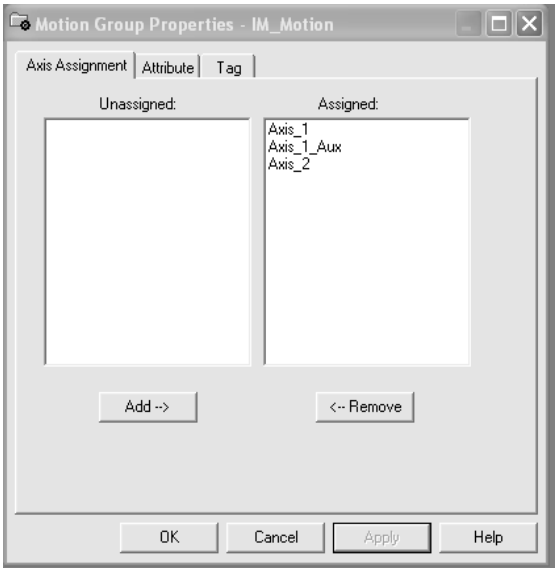
To configure the motion group:

1. Right-click Motion Groups in the explorer window and select **New Motion Group**. The New Tag window opens.

2. Name the new motion group.

3. Select **OK**. New group appears under the Motion Groups folder.

4. Right-click on the new motion group and select **Properties**. The Motion Group Properties window opens.



5. Select the **Axis Assignment** tab and move your axes (created earlier) from *Unassigned* to *Assigned*.

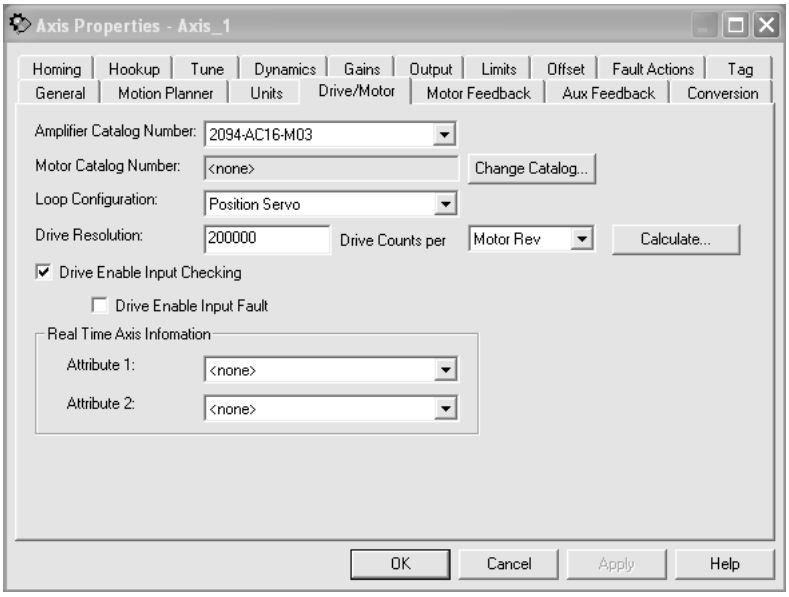
6. Select the **Attribute** tab and edit the default values as appropriate for your application.

7. Select **OK**.

Configure Axis Properties

To configure axis properties:

1. Right-click on an axis in the explorer window and select **Properties**. The Axis Properties window opens.



2. Select the **Drive/Motor** tab.

   - Set the Kinetix 6000 Amplifier (2094-*x*C*xx*-M*xx*)
   - Set the Motor Catalog Number
   - Set Loop Configuration to Position Servo
   - Drive Enable Input Checking, when checked (default), means a hard drive enable input signal is required. Uncheck to remove that requirement.

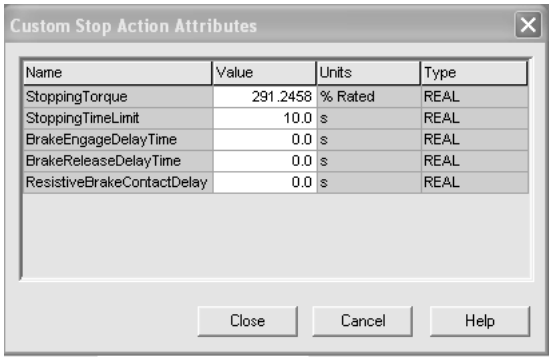
   Note: For amplifier and motor catalog numbers refer to the amplifier and motor name plate.

3. Select the **Motor Feedback** tab and verify the Feedback Type shown is appropriate for your actual hardware configuration.

4. Select the **Units** tab and edit default values as appropriate for your application.

5. Select the **Conversion** tab and edit default values as appropriate for your application.

6. Select the **Fault Actions** tab and click on the Set Custom Stop Action... tab. The Custom Stop Action Attributes window opens.



The Custom Stop Action Attributes window allows you to set delay times for servo motors and resistive brake modules. For recommended motor brake delay times, refer to the *Kinetix Motion Control Selection Guide* (publication GMC-SG001).

- Set the Brake Engage Delay Time
- Set the Brake Release Delay Time
- Set the Resistive Brake Contact Delay time (0 - 1000 ms range)

Note: The recommended delay time for 2090-XB33-*xx* and -XB120-*xx* resistive brake modules is 71 ms.

Note: If you are using RSLogix 5000 v12 or lower, refer to *Set the RBM Delay Time Using DriveExplorer* on page C-14.

- Select **Close**

7. Select **OK**.

8. Repeat steps 1-7 for each axis module.

9. Verify your Logix program and save the file.

Download Your Program

After completing the Logix configuration you must download your program to the Logix processor.

Apply Power to Your Kinetix 6000

Use the table below to determine where to begin applying power to your Kinetix 6000.

If your Kinetix 6000 system	Then
Includes a (2094-*xLxx* or -*xLxxS-xx*) LIM	Go to *Apply Power to Your Kinetix 6000 (with LIM)*
Does not include a (2094-*xLxx* or -*xLxxS-xx*) LIM	Go to *Apply Power to Your Kinetix 6000 (without LIM)*

ATTENTION

To avoid hazard of electrical shock, perform all mounting and wiring of IAM, AM, SM, LIM, RBM, or power rail prior to applying power. Once power is applied, connector terminals may have voltage present even when not in use.

Apply Power to Your Kinetix 6000 (with LIM)

This procedure assumes that you have wired and configured your Kinetix 6000 (including the LIM) and your SERCOS interface module.

IMPORTANT Follow this procedure if your Kinetix 6000 system includes a Line Interface Module (LIM).

To apply power to your Kinetix 6000 system:

1. Ensure CB1, CB2, and CB3 on the LIM are in the OFF position (refer to figures 1.4 and 1.5 for the location of the CB1, CB2, and CB3).
2. Disconnect the load to the motor(s).

ATTENTION

To avoid personal injury or damage to equipment, disconnect the load to the motor(s). Ensure each motor is free of all linkages when initially applying power to the system.

3. Apply three-phase input power to the LIM VAC Line connector.
4. Set CB3 on the LIM to the ON position.

5. Observe the Brake Power Status LED on the LIM (2094-*x*L*xx* only). Refer to Figure 1.4 for the location of the Brake Power Status LED.

If the Brake Power Status LED is	Status	Do This
Solid green	Brake power is ready	Go to step 6.
Not solid green	Brake power fault	Go to *Troubleshoot LIM Status LEDs* on page 2-12.

6. Observe the I/O Power Status LED on the LIM. Refer to Figure 1.4 (2094-*x*L*xx*) or Figure 1.5 (2094-*x*L*xx*S-*xx*) for the location of the I/O Power Status LED.

If the I/O Power Status LED is	Status	Do This
Solid green	I/O power is ready	Go to step 7.
Not solid green	I/O power fault	Go to *Troubleshoot LIM Status LEDs* on page 2-12.

7. Set CB2 on the LIM to the ON position.

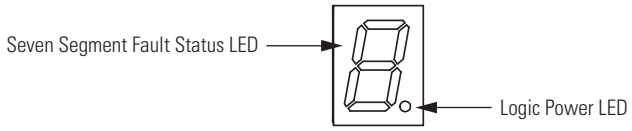
8. Set CB1 on the LIM to the ON position.

9. Verify the Hardware Enable Input signal (IOD pin 2) for each axis is at 0 volts.

If the Hardware Enable Input signal is	Then
0 volts	Go to step 10.
24 volts	1. Remove connection between IOD-1 and IOD-2. 2. Go to step 10.

10. Observe the IAM/AM front panel logic power LED as shown in the figure below.

Figure 1.13
Logic Power and Status LED Display



If the Logic Power LED is	Then
ON	Go to step 11.
Not ON	1. Check your control power connections. 2. Repeat step 10.

11. Observe the IAM/AM front panel seven segment status LED display as shown in Figure 1.13.

Note: The seven segment LED will first flash the SERCOS node address, then cycle through phases until final configuration (phase 4) is reached.

If	Is	Status	Do This
The seven segment status LED on your 2094-*x*C*xx*-M*xx* IAM or 2094-*x*M*xx* AM	Actively cycling (phase 0)	The drive is looking for a closed SERCOS ring. Wait for phase 1 or take corrective action until you reach phase 1.	Check fiber-optic connections.
	Displaying a fixed 1 (phase 1)	The drive is looking for active nodes. Wait for phase 2 or take corrective action until you reach phase 2.	Check node addressing.
	Displaying a fixed 2 (phase 2)	The drive is configuring nodes for communication. Wait for phase 3 or take corrective action until you reach phase 3.	Check program motor and drive configuration against installed hardware.
	Displaying a fixed 3 (phase 3)	The drive is configuring device specific parameters. Wait for phase 4 or take corrective action until you reach phase 4.	Check motor catalog number against selection.[1]
	Displaying a fixed 4 (phase 4)	The drive is configured and active.	Go to step 12.
	Flashing an E followed by two numbers	Drive is faulted.	Go to *Error Codes* on page 2-3.

[1] You can get diagnostic information from the module by highlighting the module name in RSLogix 5000. A Pseudo Key Failure often indicates that the motor selection does not match the motor installed.

12. Observe the Drive Status LED.

If the Drive Status LED is	Status	Do This
Off	Normal condition	Go to step 13.
Steady red	Drive is faulted	Go to *Troubleshoot IAM/AM Status LEDs* on page 2-8.

13. Observe the Comm Status LED.

If the Comm Status LED is	Status	Do This
Flashing green	Establishing communication with network	Wait for steady green.
Steady green	Communication is ready	Go to step 14.
Off	No ring present	Go to *Troubleshoot IAM/AM Status LEDs* on page 2-8.

14. Observe the Bus Status LED.

If the Bus Status LED is	Status	Do This
Steady green	Axis is enabled when status should be disabled	1. Verify Hardware Enable Input (IOD-2) is open. 2. Verify MSO instruction is not commanded in RSLogix 5000. 3. Return to *Apply Power to Your Kinetix 6000 (with LIM)* on page 1-26.
Flashing green [1]	Bus is up, axis is disabled (normal status)	Go to step 15.
Off	DC bus is not present	Go to *Troubleshoot IAM/AM Status LEDs* on page 2-8.

[1] The Follower IAM has a 2.5 second delay after DC Bus voltage is applied before the Bus Status LED begins flashing. This provides the common bus leader time to complete pre-charge.

15. Observe the three SERCOS LEDs on the SERCOS module.

If the three SERCOS LEDs are	Status	Do This
Flashing green and red	Establishing communication	Wait for steady green on all three LEDs.
Steady green	Communication ready	Go to *Test and Tune Your Axes*.
Not flashing green and red/ not steady green	SERCOS module is faulted	Go to the appropriate Logix motion module setup and configuration manual for specific instructions and troubleshooting.

Apply Power to Your Kinetix 6000 (without LIM)

This procedure assumes that you have wired and configured your Kinetix 6000 and SERCOS interface module.

IMPORTANT Follow this procedure if your Kinetix 6000 system does not include a Line Interface Module (LIM).

To apply power to your Kinetix 6000 system:

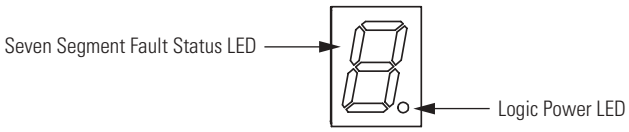
1. Disconnect the load to the motor(s).

ATTENTION 

To avoid personal injury or damage to equipment, disconnect the load to the motor(s). Ensure each motor is free of all linkages when initially applying power to the system.

2. Apply (95-264V ac) control power to the IAM (CPD connector) and observe the logic power LED as shown in the figure below.

Figure 1.14
Logic Power and Status LED Display



If the Logic Power LED is	Then
ON	Go to main step 3.
Not ON	1. Check your control power connections. 2. Repeat main step 2.

Note: The seven segment LED will first flash the SERCOS node address, then cycle through phases until final configuration (phase 4) is reached.

3. Apply 195-265V ac (230V) or 324-528V ac (460V) input power to the IAM (IPD connector) and observe the front panel seven segment Status LED display as shown in Figure 1.14.

If	Is	Status	Do This
The seven segment status LED on your 2094-*x*C*xx*-M*xx* IAM or 2094-*x*M*xx* AM	Actively cycling (phase 0)	The drive is looking for a closed SERCOS ring. Wait for phase 1 or take corrective action until you reach phase 1.	Check fiber-optic connections.
	Displaying a fixed 1 (phase 1)	The drive is looking for active nodes. Wait for phase 2 or take corrective action until you reach phase 2.	Check node addressing.
	Displaying a fixed 2 (phase 2)	The drive is configuring nodes for communication. Wait for phase 3 or take corrective action until you reach phase 3.	Check program motor and drive configuration against installed hardware.
	Displaying a fixed 3 (phase 3)	The drive is configuring device specific parameters. Wait for phase 4 or take corrective action until you reach phase 4.	Check motor catalog number against selection.[1]
	Displaying a fixed 4 (phase 4)	The drive is configured and active	Go to step 4.
	Flashing an E followed by two numbers	Drive is faulted	Go to *Error Codes* on page 2-3.

[1] You can get diagnostic information from the module by highlighting the module name in RSLogix 5000. A Pseudo Key Failure often indicates that the motor selection does not match the motor installed.

4. Observe the Drive Status LED.

If the Drive Status LED is	Status	Do This
Off	Normal condition	Go to step 5.
Steady red	Drive is faulted	Go to *Troubleshoot IAM/AM Status LEDs* on page 2-8.

5. Observe the Comm Status LED.

If the Comm Status LED is	Status	Do This
Flashing green	Establishing communication with network	Wait for steady green.
Steady green	Communication is ready	Go to step 6.
Off	No ring present	Go to *Troubleshoot IAM/AM Status LEDs* on page 2-8.

6. Observe the Bus Status LED.

If the Bus Status LED is	Status	Do This
Steady green	DC bus is present. Axis is enabled when status should be disabled.	1. Verify Hardware Enable Input (IOD-2) is open. 2. Verify MSO instruction is not commanded in RSLogix 5000. 3. Return to *Apply Power to Your Kinetix 6000 (without LIM)* on page 1-30.
Flashing green [1]	Bus is up, axis is disabled (normal status)	Go to step 7.
Off	DC bus is not present	Go to *Troubleshoot IAM/AM Status LEDs* on page 2-8.

[1] The Follower IAM has a 2.5 second delay after DC Bus voltage is applied before the Bus Status LED begins flashing. This provides the common bus leader time to complete pre-charge.

7. Observe the three SERCOS LEDs on the SERCOS module.

If the three SERCOS LEDs are	Status	Do This
Flashing green and red	Establishing communication	Wait for steady green on all three LEDs.
Steady green	Communication ready	Go to *Test and Tune Your Axes*.
Not flashing green and red/ not steady green	SERCOS module is faulted	Go to the appropriate Logix motion module setup and configuration manual for specific instructions and troubleshooting.

Test and Tune Your Axes

This procedure assumes that you have configured your Kinetix 6000, your SERCOS interface module, and applied power to the system.

IMPORTANT Before proceeding with testing and tuning your axes, verify that the IAM and AM status LEDs are as described in the table below.

Status LED	Must be	Status
Drive	Off	Normal condition
Comm	Steady green	Communication is ready
Bus	Flashing green	Bus is up, axis is disabled (normal status)
Seven Segment	Displaying a fixed 4 (phase 4)	The drive is configured and active.

For greater detail on the RSLogix 5000 software as it applies to ControlLogix and SoftLogix modules, refer to the table below for the appropriate publication.

For	Refer to this Document	Publication Number
Detailed information on configuring and troubleshooting your ControlLogix motion module	Logix5000 Motion Modules User Manual	1756-UM006
Detailed information on configuring and troubleshooting your SoftLogix PCI card	SoftLogix Motion Card Setup and Configuration Manual	1784-UM003

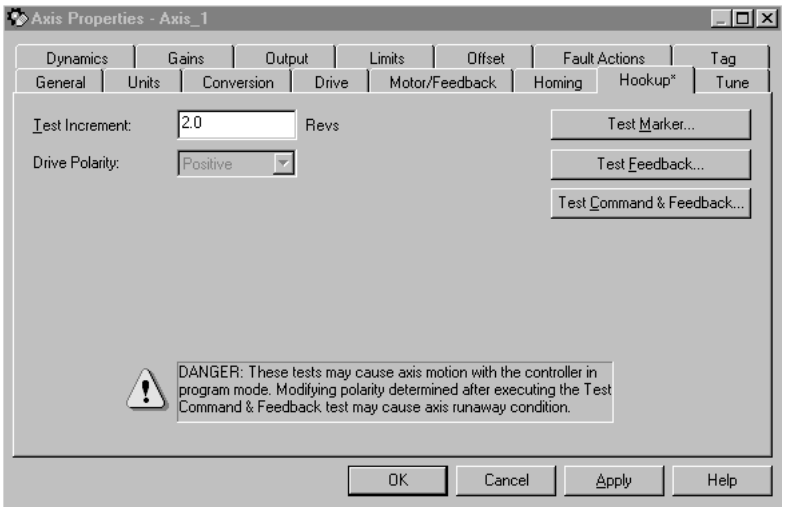
If you have already tested and tuned your Logix module using one of the setup and configuration manuals listed above, you are finished commissioning your Kinetix 6000 system. If not, go to *Test Your Axes* beginning below.

Test Your Axes

To test your axes:

1. Verify the load was removed from each axis.
2. Right-click on an axis in your Motion Group folder in the explorer window and select **Axis Properties**. The Axis Properties window appears.

3. Select the **Hookup** tab.



4. Select **2.0** as the number of revolutions for the test (or another number more appropriate for your application).

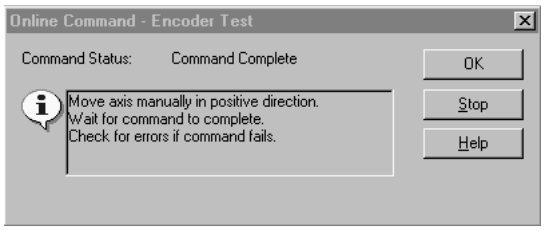
This Test	Performs this Test
Test Marker	Verifies marker detection capability as you rotate the motor shaft.
Test Feedback	Verifies feedback connections are wired correctly as you rotate the motor shaft.
Test Command & Feedback	Verifies motor power and feedback connections are wired correctly as you command the motor to rotate. Also, allows you to define polarity.

5. Apply Hardware Enable Input signal (IOD-2) for the axis you are testing.

ATTENTION

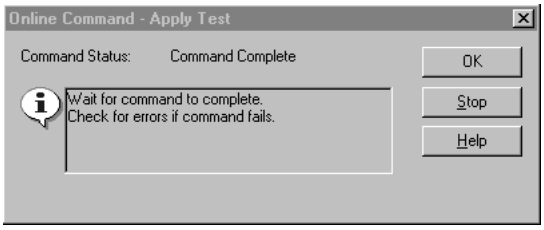
To avoid personal injury or damage to equipment, apply 24V ENABLE signal (IOD-2) only to the axis you are testing.

6. Select the **Test** (Marker/Feedback/Command & Feedback) button to verify connections. The Online Command window opens. Follow the on-screen test instructions. When the test completes, the Command Status changes from *Executing* to *Command Complete*.

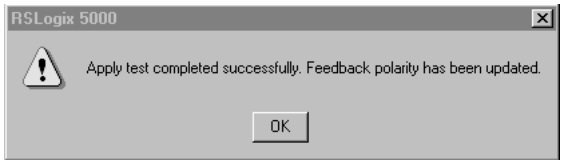
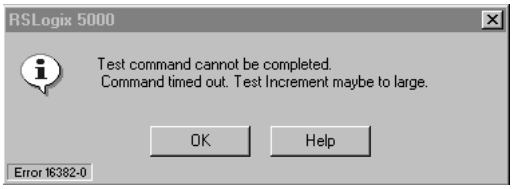


7. Select **OK**.

8. The Online Command - Apply Test window opens (Feedback and Command & Feedback tests only). When the test completes, the Command Status changes from *Executing* to *Command Complete*.



9. Select **OK**.

If	Then
Your test completes successfully, this window appears: 	1. Select **OK**. 2. Remove Hardware Enable Input signal (IOD-2). 3. Go to *Tune Your Axes*.
Your test failed, this widow appears: 	1. Select **OK**. 2. Verify the Bus Status LED turned solid green during the test. 3. Verify that the Hardware Enable Input signal (IOD-2) is applied to the axis you are testing. 4. Verify conversion constant entered in the Conversion tab. 5. Return to step 6 and run the test again.

Tune Your Axes

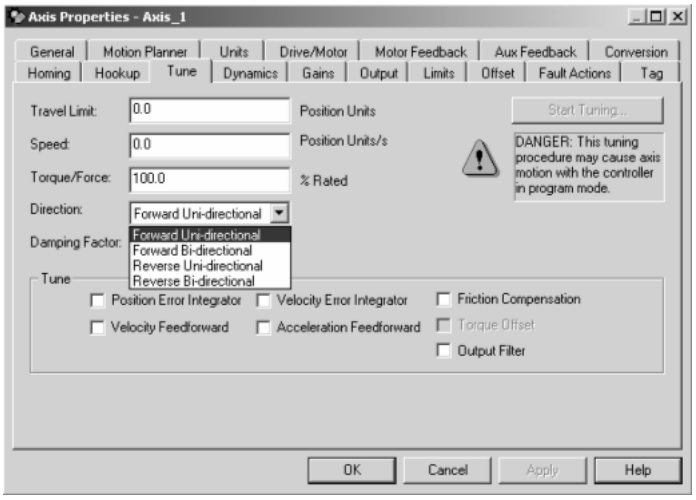
To tune your axes:

1. Verify the load is still removed from the axis being tuned.

ATTENTION

To reduce the possibility of unpredictable motor response, tune your motor with the load removed first, then re-attach the load and perform the tuning procedure again to provide an accurate operational response.

2. Select the **Tune** tab.



3. Enter values for Travel Limit and Speed. In this example, Travel Limit = 5 and Speed = 10.

   Note: Actual value of programmed units depend on your application.

4. Select setting for Direction (Forward Uni-directional is default).

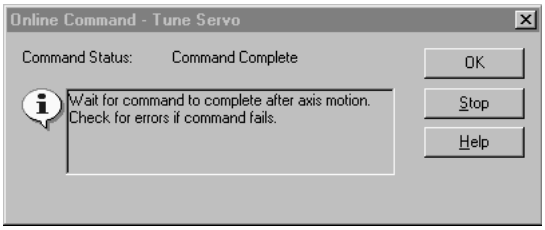
5. Check **Tune** boxes as appropriate for your application.

6. Apply Hardware Enable Input signal (IOD-2) for the axis you are tuning.

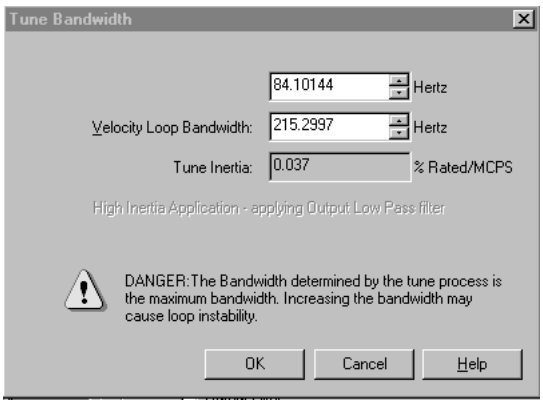
ATTENTION

To avoid personal injury or damage to equipment, apply 24V ENABLE signal (IOD-2) only to the axis you are tuning.

7. Select the **Start Tuning** button to auto-tune your axis. The Online Command - Tune Servo window opens. When the test completes, the Command Status changes from *Executing* to *Command Complete*.



8. Select **OK**. The Tune Bandwidth window opens.

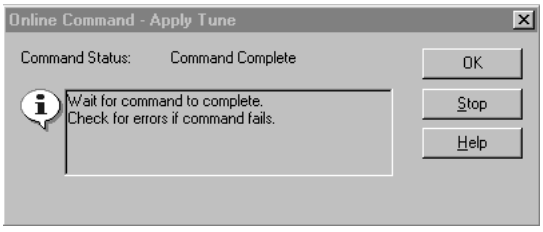


Note: Actual bandwidth values (Hz) depend on your application and may require adjustment once motor and load are connected.

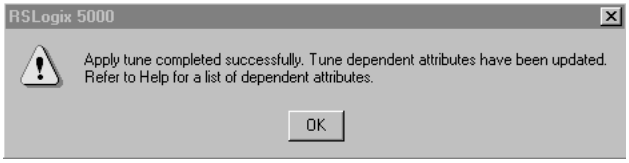
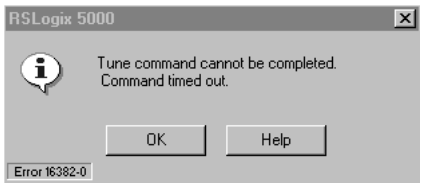
Record your bandwidth data for future reference.

9. Select **OK**.

10. The Online Command - Apply Tune window opens. When the test completes, the Command Status changes from *Executing* to *Command Complete*.



11. Select **OK**.

If	Then
Your test completes successfully, this window appears: 	1. Select **OK**. 2. Remove the Hardware Enable Input signal (IOD-2) applied earlier. 3. Go to step 12.
Your test failed, this widow appears: 	1. Select **OK**. 2. Make an adjustment to motor velocity. 3. Refer to appropriate Logix motion module setup and configuration manual for more information. 4. Return to step 7 and run the test again.

12. Repeat *Test and Tune Your Axes* for each axis.

Troubleshoot Your Kinetix 6000

Chapter Objectives

This chapter provides a description of maintenance and troubleshooting activities for the Kinetix 6000. This chapter includes:

- Safety Precautions
- General Troubleshooting
- Troubleshoot IAM/AM Status LEDs
- Troubleshoot SM Status LEDs
- Troubleshoot LIM Status LEDs
- Troubleshoot RBM Status LEDs
- Troubleshoot General System Problems
- Understand Logix/Drive Fault Behavior
- Supplemental Troubleshooting Information
- Replace Kinetix 6000 System Components

Safety Precautions

Observe the following safety precautions when troubleshooting your Kinetix 6000 drive.

ATTENTION

DC bus capacitors may retain hazardous voltages after input power has been removed, but will normally discharge in several seconds. Before working on the drive, measure the DC bus voltage to verify it has reached a safe level or wait the full time interval listed on the warning on the front of the drive. Failure to observe this precaution could result in severe bodily injury or loss of life.

Do not attempt to defeat or override the drive fault circuits. You must determine the cause of a fault and correct it before you attempt to operate the system. If you do not correct a drive or system malfunction, it could result in personal injury and/or damage to equipment as a result of uncontrolled machine system operation.

If you use an oscilloscope (or chart recorder) for troubleshooting, you must properly ground it. The oscilloscope chassis can be at a potentially fatal voltage if you do not properly ground it. Always connect the oscilloscope chassis to an earth ground.

General Troubleshooting

Refer to the *Error Codes* section to identify problems, potential causes, and appropriate actions to resolve the problems. If problems persist after attempting to troubleshoot the system, please contact your Allen-Bradley representative for further assistance. To determine if your Kinetix 6000 drive has an error, refer to the table below.

If the Logic Power LED is ON and the Status LED display on your	Is	Then
2094-*xCxx*-M*xx*-*x* IAM	Actively cycling segments in a full circle	Your Kinetix 6000 drive is ready, but SERCOS communications is not available.
	Displaying a fixed 4	Your Kinetix 6000 drive is ready.
All drives	Flashing an E followed by two numbers	Your Kinetix 6000 drive has an error. Proceed to the section *Error Codes*.

Error Codes

The following list of problematic symptoms (no error code shown) and problems with assigned error codes is designed to help you resolve problems.

When a fault is detected, the 7-segment LED will display an E followed by the flashing of the two-digit error code, one digit at a time. This is repeated until the problem is cleared.

Error Code	Fault Message **RSLogix** (HIM)	Problem or Symptom is	Potential Cause is	Possible Resolution is
		Power (PWR) indicator not ON	No AC power or auxiliary logic power.	Verify AC control power is applied to the Kinetix 6000.
			Internal power supply malfunction.	Call your Allen-Bradley representative to return module for repair.
		Motor jumps when first enabled	Motor wiring error.	• Check motor wiring. • Run Hookup test in RSLogix 5000.
			Incorrect motor chosen.	Verify the proper motor is selected.
		Digital I/O not working correctly	I/O power supply disconnected.	Verify connections and I/O power source.
E00	**BusUndervoltage Fault** (Blown fuse)	A blown fuse was detected on the inverter PCB	Blown fuse.	Call your Allen-Bradley representative to return module for repair.
E04	**MotorOvertemp Fault** (Motor Overtemp)	Motor thermal switch tripped	• High motor ambient temperature and/or • Excessive current	• Operate within (not above) the continuous torque rating for the ambient temperature 40 °C (104 °F) maximum. • Lower ambient temperature, increase motor cooling.
			Motor wiring error.	Check motor wiring at MF connector on the IAM/AM.
			Incorrect motor selection.	Verify the proper motor has been selected.
E05	**DriveOvercurrent Fault** (Power Fault)	Self-protection of the Intelligent Power Module (IPM) is indicating a major power related fault condition.	Motor cables shorted.	Verify continuity of motor power cable and connector.
			Motor winding shorted internally.	Disconnect motor power cables from the motor. If the motor is difficult to turn by hand, it may need to be replaced.
			Kinetix 6000 temperature too high.	• Check for clogged vents or defective fan. • Ensure cooling is not restricted by insufficient space around the unit.
			Operation above continuous power rating and/or product environmental ratings.	• Verify ambient temperature is not too high. • Operate within the continuous power rating. • Reduce acceleration rates.
			Kinetix 6000 has a short circuit, overcurrent, or failed component.	Remove all power and motor connections, and preform a continuity check from the DC bus to the U, V, and W motor outputs. If a continuity exists, check for wire fibers between terminals, or send drive in for repair.

Error Code	Fault Message **RSLogix** (HIM)	Problem or Symptom is	Potential Cause is	Possible Resolution is
E06	**HardOvertravel Fault** (+/- Hard Overtravel)	Axis moved beyond the physical travel limits in the positive/negative direction.	Dedicated overtravel input is inactive.	• Check wiring. • Verify motion profile. • Verify axis configuration in software.
E07	**MotFeedbackFault** (Motor Feedback Loss)	The feedback wiring is open, shorted, or missing.		• Check motor encoder wiring. • Run Hookup test in RSLogix 5000.
E09	**BusUndervoltage Fault** (Bus Undervoltage)	With three-phase power present, the DC bus voltage is below limits.	• DC bus voltage for 460V system is below 275V • DC bus voltage for 230V system is below 137V	• Verify voltage level of the incoming AC power. • Check AC power source for glitches or line drop. • Install an uninterruptible power supply (UPS) on your AC input.
		DC bus voltage fell below the undervoltage limit while an axis on the follower power rail was enabled.		Disable follower axis before removing power.
E10	**DriveOvervoltage Fault** (Bus Overvoltage)	The DC bus voltage is above limits.	Excessive regeneration of power. When the motor is driven by an external mechanical power source, it may regenerate too much peak energy through the Kinetix 6000's power supply. The system faults to save itself from an overload.	• Change the deceleration or motion profile. • Use a larger system (motor and Kinetix 6000). • Install shunt module.
			• DC bus voltage for 460V system is over 820V • DC bus voltage for 230V system is over 410V	Verify input is within specifications.
E11	**MotFeedbackFault** (Illegal Hall State)	State of Hall feedback inputs is incorrect.	Bad connections.	• Verify the Hall wiring at the MF connector on the IAM/AM. • Verify 5V power supply to the encoder.
E16	**Softovertravel Fault** (+/- Software Overtravel)	Axis position exceeded maximum software setting.		• Verify motion profile. • Verify overtravel settings are appropriate.
E18	**OverSpeedFault** (Overspeed Fault)	Motor speed has exceeded 150% of maximum rated speed. The 100% trip point is dictated by the lesser of the user velocity limits or the motor rated base speed.		• Check cables for noise. • Check tuning.
E19	**PositionErrorFault** (Follow Error)	Position error limit was exceeded.		• Increase the feed forward gain. • Increase following error limit or time. • Check position loop tuning. • Verify sizing of system. • Verify mechanical integrity of system within specification limits.
E20	**MotFeedbackFault** (Mtr Fdbk AQB)	Motor Encoder State Error	The motor encoder encountered an illegal transition.	• Use shielded cables with twisted pair wires. • Route the feedback away from potential noise sources. • Check the system grounds. • Replace the motor/encoder.
E21	**AuxFeedbackFault** (Aux Feedback Comm)	Communication was not established with an intelligent encoder.		Verify auxiliary encoder wiring.

Error Code	Fault Message **RSLogix** (HIM)	Problem or Symptom is	Potential Cause is	Possible Resolution is
E30	**MotFeedbackFault** (Motor Feedback Comm)	Communication was not established with an intelligent encoder.		• Verify motor selection. • Verify the motor supports automatic identification. • Verify motor encoder wiring.
E34	**GroundShortFault** (Ground Fault)	Excessive ground current in the converter was detected.	Wiring error.	• Check motor power wiring. • Check input power wiring (refer to *Kinetix 6000 Installation Manual*, publication 2094-IN001).
			Motor internal ground short.	Replace motor.
			Internal malfunction.	Disconnect motor power cable from drive and enable drive with current limit set to 0. If fault clears, then a wiring error or motor internal problem exists. If fault remains, call your A-B representative.
			Grounded control power terminal (applies to 230V systems only)	• Remove ground from control power input. • Wire control power to use main power as shown in Figure A.3. • Add isolation transformer for control power.
E35	**DriveUndervoltage Fault** (Pre-charge Fault)	Converter pre-charge cycle failed.	Low AC input voltage.	Check input AC voltage on all phases.
			Internal malfunction.	Call your A-B representative.
E36	**DriveOvertemp Fault** (System Overtemperature)	Converter thermal switch tripped.	Excessive heat exists in the power circuitry.	• Reduce acceleration rates. • Reduce duty cycle (ON/OFF) of commanded motion. • Increase time permitted for motion. • Use larger Kinetix 6000 converter. • Check for clogged vents or defective fan. • Ensure cooling is not restricted by insufficient space around the unit.
E37	**PowerPhaseLoss Fault** (Phase Loss Flt)	• One or more phases of the input AC power is missing. • Axis was enabled when main (3-phase) power was removed. • Common bus follower axis was enabled when DC bus power was removed.		• Check input AC voltage on all phases. • Disable axis before removing power.
E38	**SERCOSFault** (SERCOS Ring Flt)	The SERCOS ring is not active after being active and operational.	Cable disconnected.	Check that fiber-optic cable is present and connected properly.
E39	**DriveHardFault** (Self Sense Flt)	Self-sensing Commutation Startup Error	Motion required for self-sensing startup commutation was obstructed.	• Verify that there are no impediments to motion at startup, such as hard limits. • Increase self-sensing current if high friction or load conditions exist. • Check motor or encoder wiring using wiring diagnostics.
E43	**DriveEnableInput Fault** (Drive Enable Flt)	Missing Drive Enable Input Signal	• An attempt was made to enable the axis through software while the Drive Enable hardware input was inactive. • The Drive Enable input transitioned from active to inactive while the axis was enabled.	• Disable the Drive Enable Input fault. • Verify that Drive Enable hardware input is active whenever the drive is enabled through software.

Error Code	Fault Message **RSLogix** (HIM)	Problem or Symptom is	Potential Cause is	Possible Resolution is
E49	**DriveHardFault** (Safe-Off HW Flt)	For symptom, cause, and resolution of this error code, refer to the *Kinetix Safe-Off Feature Safety Reference Manual* (publication GMC-RM002). Applies to IAM (2094-*x*C*xx*-M*xx*-S) and AM (2094-*x*M*xx*-S) with Safe-Off feature.		
E50	**SERCOSFault** (SERCOS Same ADDR)	Duplicate node address detected on SERCOS ring.		Verify that each SERCOS drive is assigned a unique node address.
E54	**DriveHardFault** (Ifbk HW Fault)	Current feedback hardware fault detected.		Replace the module
E60	**DriveHardFault** (Unknown Axis)	Illegal ID bits detected		Replace the module
E61	**AuxFeedbackFault** (Aux Fdbk AQB)	Auxiliary Encoder State Error	The auxiliary encoder encountered an illegal transition.	• Use shielded cables with twisted pair wires. • Route the feedback away from potential noise sources. • Check the system grounds. • Replace the motor/encoder.
E62	**AuxFeedbackFault** (Aux Fdbk Loss)	The feedback wiring is open, shorted, or missing.		Check the motor feedback cable connectors/wiring to the IAM/AM and motor.
E63	**AuxFeedbackNoise** (Aux Fdbk Noise)	Noise on auxiliary feedback cable.	Recommended grounding, per installation instructions, has not been followed.	• Verify grounding. • Route feedback cable away from noise sources. • Refer to *System Design for Control of Electrical Noise Reference Manual* (publication GMC-RM001).
E64	**MotorFeedbackNoise** (Mtr Fdbk Noise)	Noise on motor feedback cable.		
E65	**No Fault Message (condition indicated by on-screen message)** (Hookup Fault)	Hookup procedure failed	Motor or feedback device malfunction.	• Check motor power/feedback wiring. • Refer to on-screen message for resolution.
E66	**No Fault Message (condition indicated by on-screen message)** (Atune Flt)	Autotune procedure failed	Motor or feedback device malfunction.	• Check motor power/feedback wiring. • Refer to on-screen message for resolution. • Perform Hookup in RSLogix 5000. • Consult RSLogix 5000 help screen.
E67	**DriveHardFault** (Task init)	Operating system failed	Software initialization fault detected due to hardware failure.	• Cycle power. • If fault persists, replace module.
E68	**DriveHardFault** (SCANport Comm)	DPI communication failed	The DPI device or cable is faulty.	Check DPI connections.
E69	**DriveHardFault** (Objects Init)	Non-volatile memory is corrupt due to control board hardware failure.		Load default parameters, save to non-volatile memory, and recycle power or reset the drive.
E70	**DriveHardFault** (NV Mem Init)	Non-volatile memory is corrupt due to control board software error.		Load default parameters, save to non-volatile memory, and recycle power or reset the drive.
E71	**DriveHardFault** (Memory Init)	RAM or Flash memory validation failure		• Cycle power. • If fault persists, replace module.

Error Code	Fault Message **RSLogix** (HIM)	Problem or Symptom is	Potential Cause is	Possible Resolution is
E72	**DriveOvertemp Fault** (Drive Overtemp)	Inverter thermal switch tripped	The fan on the IAM or an AM failed.	Replace the failed module.
			The cabinet ambient temperature is above rating.	Check the cabinet temperature.
			The machine duty cycle requires an RMS current exceeding the continuous rating of the controller.	Change the command profile to reduce speed or increase time.
			The airflow access to the Kinetix 6000 is limited or blocked.	Check airflow and re-route cables away from the Kinetix 6000.
E73	**Communicate** (Backplane Comm)	Power rail CAN communications failed.		Check module for proper mount.
		Power rail connection shorted or open.		Check power rail and module for foreign objects.
E74	**DriveOvercurrent Fault** (Bus OverCurrent)	DC link current exceeds rating.	Motor or transmission malfunction.	• Check for proper motor sizing. • Check/replace transmission device. • Check/replace motor.
			IAM not properly sized.	• Check for proper IAM sizing. • Install larger kW rated IAM.
E75	**DriveOvervoltage Fault** (Shunt Time Out)	The IAM, AM, or SM has exceeded its shunt resistor continuous rating.		• Use a properly sized shunt or modify duty cycle of the application. • System uses internal shunt and requires external shunt for additional capacity.
E76	**DriveHardFault** (Can Init)	DPI hardware initialization fault detected.	Control board hardware failure.	• Reset System. • If fault persists, replace system module.
E77	**DriveHardFault** (Module Mismatch)	Either 230V AM is installed on power rail with 460V IAM, or 460V AM is installed on power rail with 230V IAM.		Replace mismatched module.
E78	**DriveHardFault** (SERCOS Init)	Control hardware fault detected.		• Cycle power. • If fault persists, replace module.
E79	**DriveOvervoltage Fault** (Shunt Module Flt)	SM Temperature Fault LED status is Steady Red	Refer to *Temperature Fault LED* on page 2-11.	
		SM Shunt Fault LED status is Steady Red	Refer to *Shunt Fault LED* on page 2-11.	
		Module missing from power rail.		• Install missing module on power rail. • Fill empty slot with slot filler module.
E80	**DriveHardFault** (CPLD FLT)	Control hardware fault detected.		Replace module.
E81	**DriveHardFault** (Common Bus FLT)	Follower IAM detected AC input power being applied.		Remove AC input power connections from Follower IAM.
E90	**DriveHardFault** (Pre-charge Timeout FLT)	Pre-charge resistor power exceeds the resistor rating.		Allow resistor to cool.
All others	RESERVED			Call your local Allen-Bradley representative.

Troubleshoot IAM/AM Status LEDs

Drive Status LED

Use the table below for troubleshooting the Drive Status LED on your Kinetix 6000 IAM (2094-*x*C*xx*-M*xx*) or AM (2094-*x*M*xx*).

If the Drive Status LED is	Status is	Potential Cause is	Possible Resolution is
Off	Normal, no faults	N/A	N/A
Steady Red	Drive faulted	Seven-segment LED displays error code	Refer to the section *Error Codes* and continue troubleshooting.

Comm Status LED

Use the table below for troubleshooting the Comm Status LED on your Kinetix 6000 IAM (2094-*x*C*xx*-M*xx*) or AM (2094-*x*M*xx*).

If the Comm Status LED is	Status is	Potential Cause is	Possible Resolution is
Steady Green	Communication ready	No faults or failures.	N/A
Flashing Green	Establishing communication	System is still in the process of establishing SERCOS communication.	Wait for steady green LED status.
		Node address setting on the drive module does not match SERCOS controller configuration.	Verify proper node switch setting.
Off	No communication [1]	Loose fiber-optic connection.	Verify proper fiber-optic cable connections.
		Broken fiber-optic cable.	Replace fiber-optic cable.
		Receive fiber-optic cable connected to SERCOS transmit connector and vice versa.	Check proper SERCOS fiber-optic cable connections.

[1] Refer to *Fiber Optic Cable Installation and Handling Instructions* (publication 2090-IN010) for more information.

Bus Status LED

Use the table below for troubleshooting the Bus Status LED on your Kinetix 6000 IAM (2094-*x*C*xx*-M*xx*) or AM (2094-*x*M*xx*).

If the Bus Status LED is	Status is	Condition
Steady Green	Bus power is present, axis enabled. No faults or failures.	Normal when: • 24V is applied to Hardware Enable Input (IOD-2). • MSO instruction is commanded in RSLogix 5000 software.
Flashing Green	Bus power is present, axis disabled. No faults or failures.	Normal when: • 24V is *not* applied to Hardware Enable Input (IOD-2). • MSO instruction is *not* commanded in RSLogix 5000 software.
Off	Bus power not present.	• Normal when bus power is not applied. • Fault exists, refer to seven segment Error Code and *General Troubleshooting* beginning on page 2-2.
	Bus power is present in Follower IAM.	• Follower IAM is not configured as Common Bus Follower in RSLogix 5000. • After DC bus voltage is applied, a 2.5 second delay before the LED begins flashing green is normal operation to provide common bus leader time to complete pre-charge.

Troubleshoot SM Status LEDs

Each of the shunt module LEDs provide specific troubleshooting information, as described in *Bus Status LED*, *Temperature Fault LED*, and *Shunt Fault LED*.

IMPORTANT Use of the Kinetix 6000 (rail mounted) shunt module (catalog number 2094-BSP2), requires IAM/AM firmware revision 1.068 or above.

General Shunt Module Troubleshooting

Shunt Module Faults are	Under these Conditions
Latched	Until fault condition is corrected and cleared.
Cleared	• Using RSLogix MASR, MAFR, MGSR commands or the HIM (red stop button). • Only after the DC bus is discharged (SM Bus Status LED is flashing). • Drive must be configured with 2094-BSP2 or Bulletin 1394 external shunt module.

IAM/AM Internal Shunts are	Under these Conditions
Disabled (for DC Bus regulation)	• When the 2094-BSP2 shunt module is used on a 230V system. • When either 230V or 460V system is configured with a Bulletin 1394 external shunt module. • When configured in common bus follower mode.
Enabled to discharge the DC Bus	Drive (IAM or IAM Leader) three-phase power is removed.
Disabled from discharging the DC bus	When configured in common bus follower mode.

IMPORTANT Under some fault conditions, two reset commands may be required to clear drive and SM faults.

The following table applies when all three SM LEDs are flashing.

Status is	Potential Cause is	Possible Resolution is
All three SM status LEDs flash simultaneously	Shunt module hardware failure	• Cycle power • If problem persists, replace shunt module

Bus Status LED

Use the table below for troubleshooting the Bus Status LED on your Kinetix 6000 SM (2094-BSP2).

If the Bus Status LED is	Status is	Potential Cause is	Possible Resolution is
Flashing	Normal condition when control power is applied and bus voltage is less than 60V dc.		N/A
Steady Green	Normal condition when control power is applied and bus voltage is greater than 60V dc.		N/A
Off	Control power is not present	Internal power supply failure	Replace shunt module.

Temperature Fault LED

Use the table below for troubleshooting the Temperature Fault LED on your Kinetix 6000 SM (2094-BSP2).

If the Temp Fault LED is	Status is	Potential Cause is	Possible Resolution is
Off	Normal condition		N/A
Steady Red	SM internal temperature exceeds operating temperature specification	Shunt module fan failed	Replace shunt module.
		Shunt module temperature exceeds rating	• Allow shunt module to cool. • Reset faults. • Verify IAM bus regulator configuration.
	External over temperature condition	External temperature switch is open	• Allow shunt module to cool. • Reset faults. • Verify IAM bus regulator configuration.
		TS jumper is not present	Install jumper.

Shunt Fault LED

Use the table below for troubleshooting the Shunt Fault LED on your Kinetix 6000 SM (2094-BSP2).

If the Shunt Fault LED is	Status is	Potential Cause is	Possible Resolution is
Off	Normal condition		N/A
Steady Red	Shorted internal or external shunt resistor	Mis-wired shunt jumper or other short on RC connector	• Correct mis-wire (shorted) condition • If problem persists, replace shunt module
		Mis-wired (shorted) external shunt wiring	

Troubleshoot LIM Status LEDs

The following troubleshooting table applies to the following Line Interface Module status LEDs:

- 24V Power status LED (2094-AL75S, -BL75S, and -XL75S-C*x*)
- Brake Power status LED (2094-AL09 and -BL02)
- I/O Power status LED (2094-AL09 and -BL02)

If the Status LED is	Status is	Potential Cause is	Possible Resolution is
Steady Green	Normal, 24V power enabled	N/A	N/A
Off	• 24V power disabled (2094-AL75S, -BL75S, and XL75S-C*x*) • Brake power disabled (2094-AL09, and -BL02) • I/O power disabled (2094-AL09, and -BL02)	CB3 is open	• Set breaker to on position. • If breaker continues to trip, call your Allen-Bradley representative to return module for repair.
		24V polarity is reversed at the load	• Correct polarity. • If polarity is correct and LED is not steady green, call your Allen-Bradley representative to return module for repair.

Troubleshoot RBM Status LEDs

The Resistive Brake Module (RBM) contactor status LED is visible from the front of the RBM. Use the table below for troubleshooting the RBM status LEDs.

24V dc Status LED

The 24V dc Status LED is on when 24V is applied between COIL_A1 and COIL_A2 (e.g. a Brake Enable signal is received from the drive).

If the Status LED is	RBM Contactor Status is	Potential Cause is	Possible Resolution is
Steady Green	Contactor engaged (direct connection between drive and motor)	No faults or failures	N/A
	Contactor disengaged (no connection between drive and motor)	Contactor failure	• Monitor CONSTAT_41/42 status to verify lack of drive/motor power (output is NC). • Contact A-B representative.
Blinking Green (audible clicking)	Contactor rapidly engaging/ disengaging	Recommended grounding not followed	• Verify ground wiring. • Route wires away from noise sources. • Refer to *System Design for Control of Electrical Noise Reference Manual* (publication GMC-RM001).
		Control circuit improperly wired	Verify control wiring and programming.
Off (intended)	Contactor disengaged (connection open between drive and motor)	No faults or failures	N/A
Off (unintended)		+24V not applied between COIL_A1 and COIL_A2	• +24V supply is off. • Verify wiring. • Drive not enabled. • Contact A-B representative.
		T1 (Fault) thermostat open	Duty cycle exceeded, allow RBM to cool.

230V ac Auxiliary Power Status LED

Note: The 230V ac Auxiliary Power Status LED only applies to 2090-XB120-*xx* RBMs.

The 230V ac Status LED is on when 230V ac is applied to L1 and L2 (TB4) and the contactor is engaged by applying 24V dc across COIL_A1 and COIL_A2 (e.g. a Brake Enable signal is received from the drive).

If 230V Status LED is	Contactor Status is	Potential Cause is	Possible Resolution is
Steady Green	Contactor Engaged (direct connection between drive and motor)	No faults or failures	N/A
	Contactor Disengaged (no connection between drive and motor)	Contactor failure	• Monitor CONSTAT_41/42 status to verify lack of drive/motor power (output is NC). • Contact A-B representative.
Blinking Green (audible clicking)	Contactor rapidly engaging/disengaging	Grounding	• Verify ground wiring. • Route wires away from noise sources. • Refer to *System Design for Control of Electrical Noise Reference Manual* (publication GMC-RM001).
		230V ac is varying	• Check VAC loading. • Check VAC source. • Verify wiring.
		Control circuit improperly wired	Verify control wiring and programming.
Off (intended)	Contactor Engaged	Contactor failure (contacts welded together)	• Monitor CONSTAT_41/42 status to verify lack of drive/motor power (output is NC). • Contact A-B representative.
	Contactor Disengaged	No faults or failures	N/A
Off (unintended)	Contactor Engaged	Contactor failure (contacts welded together)	• Monitor CONSTAT_41/42 status to verify lack of drive/motor power (output is NC). • Contact A-B representative.
		LED failure	• Contact A-B representative.
	Contactor Disengaged	+24V signal not functioning properly	Refer to *24V dc Status LED* troubleshooting table on page 2-12.
		Contactor failure (coil damaged)	Contact A-B representative.
		No 230V ac signal	• Verify wiring. • Verify 230V ac source.

Troubleshoot General System Problems

Use the tables below for troubleshooting general system faults. For a list of Bulletin 1756 product manuals, refer to *Related Documentation* in the *Preface*.

Condition	Potential Cause is	Possible Resolution is
Axis or System is unstable	The position feedback device is incorrect or open.	Check wiring.
	Unintentionally in torque mode.	Check to see what primary operation mode was programmed.
	Motor tuning limits are set too high.	Run Tune in RSLogix 5000.
	Position loop gain or position controller accel/decel rate is improperly set.	Run Tune in RSLogix 5000.
	Improper grounding or shielding techniques are causing noise to be transmitted into the position feedback or velocity command lines, causing erratic axis movement.	Check wiring and ground.
	Motor Select limit is incorrectly set (servo motor is not matched to axis module).	• Check setups. • Run Tune in RSLogix 5000.
	Mechanical resonance	Notch filter or output filter may be required (refer to Axis Properties window, Output tab in RSLogix 5000).
You cannot obtain the motor acceleration/deceleration that you want	Torque Limit limits are set too low.	Verify that current limits are set properly.
	Incorrect motor selected in configuration.	Select the correct motor and run Tune in RSLogix 5000 again.
	The system inertia is excessive.	• Check motor size vs. application need. • Review servo system sizing.
	The system friction torque is excessive.	Check motor size vs. application need.
	Available current is insufficient to supply the correct accel/decel rate.	• Check motor size vs. application need. • Review servo system sizing.
	Acceleration limit is incorrect.	Verify limit settings and correct them, as necessary.
	Velocity Limit limits are incorrect.	Verify limit settings and correct them, as necessary.
Motor does not respond to a Velocity Command	The axis cannot be enabled for 1.5 seconds after disabling.	Disable the axis, wait for 1.5 seconds, and enable the axis.
	Enable signal has not been applied or the enable wiring is incorrect.	• Check the controller. • Check the wiring.
	The motor wiring is open.	Check the wiring.
	The motor thermal switch has tripped.	• Check for a fault. • Check the wiring.
	The motor has malfunctioned.	Repair or replace the motor.
	The coupling between motor and machine has broken (i.e., the motor moves, but the load/machine doesn't).	Check and correct the mechanics.
	Primary operation mode is set incorrectly.	Check and properly set the limit.
	Velocity or current limits are set incorrectly.	Check and properly set the limit(s).

Condition	Potential Cause is	Possible Resolution is
Presence of noise on Command or motor feedback signal wires	Recommended grounding per installation instructions have not been followed.	• Verify grounding. • Route wire away from noise sources. • Refer to *System Design for Control of Electrical Noise* (publication GMC-RM001).
	Line frequency may be present.	• Verify grounding. • Route wire away from noise sources.
	Variable frequency may be velocity feedback ripple or a disturbance caused by gear teeth or ballscrew balls etc. The frequency may be a multiple of the motor power transmission components or ballscrew speeds resulting in velocity disturbance.	• Decouple the motor for verification. • Check and improve mechanical performance of the gearbox, ballscrew, etc.
No Rotation	The motor connections are loose or open.	Check motor wiring and connections.
	Foreign matter is lodged in the motor.	Remove foreign matter.
	The motor load is excessive.	Verify the servo system sizing.
	The bearings are worn.	Return the motor for repair.
	The motor brake is engaged (if supplied).	• Check brake wiring and function. • Return the motor for repair.
	The motor is not connect to the load.	Check coupling.
Motor Overheating	The duty cycle is excessive.	Change the command profile to reduce accel/decel or increase time.
	The rotor is partially demagnetized causing excessive motor current.	Return the motor for repair.
Abnormal Noise	Motor tuning limits are set too high.	Run Tune in RSLogix 5000 again.
	Loose parts are present in the motor.	• Remove the loose parts. • Return motor for repair. • Replace motor.
	Through bolts or coupling is loose.	Tighten bolts.
	The bearings are worn.	Return motor for repair.
	Mechanical resonance	Notch filter may be required (refer to Axis Properties window, Output tab in RSLogix 5000).
Erratic Operation - Motor locks into position, runs without control or with reduced torque	Motor power phases U and V, U and W, or V and W reversed.	Check and correct motor power wiring.
	Sine, Cosine or Rotor leads are reversed in the feedback cable connector.	Check and correct motor feedback wiring.
	Sine, Cosine, Rotor lead sets of resolver feedback are reversed.	Check and correct motor feedback wiring.

Understand Logix/Drive Fault Behavior

This section provides the drive fault actions and indicates whether the fault action is programmable.

The following drive fault action definitions apply:

Drive Fault Action	Definition
Shutdown	The drive disables and the contactor enable relay opens. Uncontrolled stop, motor coasts to a stop.
Disable Drive	The drive is disabled. Uncontrolled Stop, motor coasts to a stop.
Stop Motion	Logix configuration for velocity loop Kp/Ki is followed. When zero speed is reached or stopping time is exceeded, the drive is disabled. Note: Stopping time and stopping torque are configurable parameters in RSLogix 5000.
Status Only	Drive continues to operate. Status is provided by 7-Segment Fault Status LED, Drive Status LED, and DPI (if used).

Fault Message RSLogix (HIM)	Error Code	Description	Drive Fault Action	RSLogix Programmable Fault Action?
BusUndervoltageFault (Blown fuse)	E00	A blown fuse was detected in the inverter pcb.	SHUTDOWN	N
MotorOvertempFault (Motor Overtemp)	E04	The motor thermal switch was tripped. Note: Firmware I^2t protection does not generate a fault, rather it dynamically folds back current when 110% of motor rating is reached. Setting the Motor Thermal fault action to Status Only will bypass this function.	STOP	Y
DriveOvercurrentFault (Power Fault)	E05	An instantaneous over-current was detected in the inverter power section.	SHUTDOWN	N
HardOvertravelFault (+/- Hard Overtravel)	E06	Axis moved beyond the physical travel limits in the positive/negative direction. This fault can be configured for status only.	STOP	Y
MotFeedbackFault (Motor Feedback Loss)	E07	The feedback wiring is open, shorted or missing.	DISABLE	N
BusUndervoltageFault (Bus Under Voltage)	E09	With 3 phase present, the DC bus voltage is below limits. The trip point is 275V and 137V DC for 460V/230V drives respectively. DC bus voltage is below limits when any axis on common bus follower power rail was enabled.	SHUTDOWN	N
DriveOvervoltageFault (Bus Overvoltage)	E10	The DC bus voltage is above limits. The trip point is 820V and 410V DC for 460V/230V drives respectively.	SHUTDOWN	N
MotFeedbackFault (Illegal Hall State)	E11	State of Hall feedback inputs in incorrect.	DISABLE	N
SoftovertravelFault (+/- Software Overtravel)	E16	Axis position exceeded maximum software setting in the positive/ negative direction. This fault can be configured for status only.	STOP	Y
OverSpeedFault (Overspeed Fault)	E18	Axis speed has reached 150% of the maximum rated setting. The 100% trip point is dictated by the lesser of the user velocity limits or the motor rated base speed.	DISABLE	N
PositionErrorFault (Follow Error)	E19	Axis position error limit has been exceeded. This fault can be configured for status only.	STOP	Y

Fault Message RSLogix (HIM)	**Error Code**	**Description**	**Drive Fault Action**	**RSLogix Programmable Fault Action?**
MotFeedbackFault (Mtr Fdbk AQB)	E20	Motor encoder has encountered an illegal state transition.	DISABLE	N
AuxFeedbackFault (Aux Feedback Comm)	E21	Communication was not established with an intelligent (i.e. Stegmann) encoder on the Auxiliary feedback port.	STOP	N
MotFeedbackFault (Motor Feedback Comm)	E30	Communication was not established with an intelligent (i.e. Stegmann) encoder on the Motor feedback port.	STOP	N
GroundShortFault (Ground Fault)	E34	Excessive ground current in the converter was detected.	SHUTDOWN	N
DriveUndervoltageFault (Precharge Fault)	E35	The converter pre-charge cycle has failed.	SHUTDOWN	N
DriveOvertempFault (System Overtemperature)	E36	Converter internal temperature limit exceeded.	SHUTDOWN	N
PowerPhaseLossFault (Phase Loss Flt)	E37	• One or more phases of the input AC power is missing. • Axis was enabled when main (3-phase) power was removed. • Common bus follower axis was enabled when DC bus power was removed.	SHUTDOWN/ STOP	N
SERCOSFault (SERCOS Ring Flt)	E38	The SERCOS ring is not active after being active and operational.	STOP	N
DriveHardFault (Self Sense Flt)	E39	Self-sensing commutation fault detected	DISABLE	N
DriveEnableInputFault (Drive Enable Flt)	E43	Generated when Enable input switches off when drive is enabled.	STOP	Y
DriveHardFault (Safe-Off HW Flt)	E49	Safe-off function mismatch. Drive will not allow motion. Refer to the *Kinetix Safe-Off Feature Safety Reference Manual* (publication GMC-RM002) for more information. Applies to IAM (2094-*x*C*xx*-M*xx*-S) and AM (2094-*x*M*xx*-S) with Safe-Off feature.	SHUTDOWN	N
SERCOSFault (SERCOS Same ADDR)	E50	Duplicate node address detected on SERCOS ring.	STOP	N
DriveHardFault (Ifbk HW Fault)	E54	Current feedback hardware fault detected.	SHUTDOWN	N
DriveHardFault (Unknown Axis)	E60	Invalid module type identified by firmware during power on	SHUTDOWN	N
AuxFeedbackFault (Aux Fdbk AQB)	E61	Auxiliary encoder has encountered an illegal state transition.	DISABLE	N
AuxFeedbackFault (Aux Fdbk Loss)	E62	The feedback wiring is open, shorted or missing.	DISABLE	N
AuxFeedbackNoise (Aux Fdbk Noise)	E63	Presence of noise on auxiliary feedback cable.	DISABLE	Y
MotorFeedbackNoise (Mtr Fdbk Noise)	E64	Presence of noise on motor feedback cable.		
No Fault Message (condition indicated by on-screen message) (Hookup Fault)	E65	Hookup procedure failed	DISABLE	N

Fault Message RSLogix (HIM)	**Error Code**	**Description**	**Drive Fault Action**	**RSLogix Programmable Fault Action?**
No Fault Message (condition indicated by on-screen message) (Atune Flt)	E66	Autotune procedure failed	DISABLE	N
DriveHardFault (Task init)	E67	Operating System Failed	SHUTDOWN	N
DriveHardFault (SCANport Comm)	E68	DPI Communication Failed	STOP	N
DriveHardFault (Objects Init)	E69	Non-Volatile Memory attribute out of range	SHUTDOWN	N
DriveHardFault (NV Mem Init)	E70	Non-Volatile Memory Corrupted	SHUTDOWN	N
DriveHardFault (Memory Init)	E71	RAM or Flash memory validation failure.	SHUTDOWN	N
DriveOvertempFault (Drive Overtemp)	E72	Inverter temperature limit exceeded. Note: Firmware I^2t protection does not generate a fault, rather it dynamically folds back current when 110% of drive rating is reached.	SHUTDOWN	Y
Communicate (Backplane Comm)	E73	Power Rail Backplane CAN communications failed	STOP	N
DriveOvercurrentFault (Bus OverCurrent)	E74	The converter has exceeded its converter rating.	SHUTDOWN	N
DriveOvervoltageFault (Shunt Time Out)	E75	The IAM, AM, or SM has exceeded its shunt resistor continuous rating. Note: SHUTDOWN for IAM, DISABLE for AM. IAM also provides fault handling for Shunt Module.	SHUTDOWN	N
DriveHardFault (Can Init)	E76	Either DPI or Backplane CAN initialization failure	SHUTDOWN	N
DriveHardFault (Module Mismatch)	E77	Generated by IAM if the power rating of one of the AM's on the power rail does not match with IAM input power rating	SHUTDOWN	N
DriveHardFault SERCOS Init	E78	Control hardware fault detected	SHUTDOWN	N
DriveOvervoltageFault (Shunt Module Flt)	E79	Power Rail mounted Shunt Module Fault. Displayed on IAM 7-segment fault status LED.	SHUTDOWN	N
HardwareFault (CPLD FLT)	E80	Control hardware fault detected	SHUTDOWN	N
HardwareFault (Common Bus FLT)	E81	Common Bus Follower IAM detected AC input power being applied.	SHUTDOWN	N
HardwareFault (Pre-charge Timeout FLT)	E90	Pre-charge resistor power exceeds the resistor rating.	SHUTDOWN	N
RESERVED	All Others			

Supplemental Troubleshooting Information

This section provides information for accessing and changing parameters not accessible through RSLogix 5000 software.

Tools for Changing Parameters

Most parameters are accessible through RSLogix 5000 software. Alternatives to RSLogix 5000 software for changing parameters include the DPI compatible Human Interface Module (HIM) and DriveExplorer software. Refer to the table below for catalog numbers.

Method	Description	Catalog Number	Firmware Revision
DriveExplorer	DriveExplorer Software [1]	9306-4EXP02ENE	2.01 or later
	Serial to SCANport Adapter	1203-SSS (Series B)	3.004 or later
HIM	Full Numeric LCD HIM	20-HIM-A3 [2]	N/A

[1] Refer to *DriveExplorer Getting Results Manual* (publication 9306-GR001) for instructions.

[2] Compatible catalog numbers include all 20-HIM-A*x*.

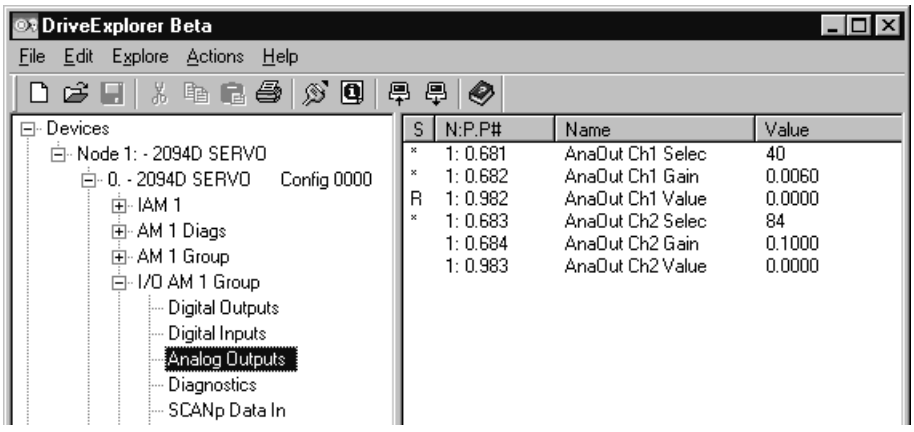
Changing Parameters Using DriveExplorer

To navigate using DriveExplorer, refer to the figure below. In this example, the I/O Interface group folder is open, the Analog Outputs parameter is selected, and the parameter elements are displayed in the box to the right.

IMPORTANT Parameters are read-only when SERCOS ring is active. You must break SERCOS ring to change parameters.

To save changes, perform a non-volatile save (NVS) prior to cycling power.

Figure 2.1
DriveExplorer Example



Changing Parameters Using the HIM

When using the HIM to monitor or change parameters, use the up and down arrows (∧ and ∨) to arrive at selections. Refer to the instructions that came with your HIM for more information.

To monitor or change parameters using the HIM:

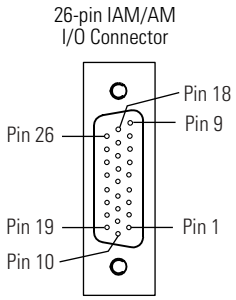
1. Select parameter. Press ↵.
2. Select **I/O AM1 Group** (for IAM). Press ↵.
3. Select **Analog Outputs**. Press ↵.
   - Analog Output 1 is displayed. Press ↵.
   - For Analog Output 2 use arrows to select. Press ↵.
4. Press **Sel**.
5. Enter parameter number. Press ↵.

Using Analog Test Points to Monitor System Variables

There are two analog output test points accessible from the IOD 26-pin connector on each IAM and AM (refer to figures and 1.2 for connector locations).

IOD Pin	Description	Signal
23	Analog Output 0	DAC0
24	Analog Output Common	DAC_COM
25	Analog Output 1	DAC1
26	Analog Output Common	DAC_COM

Figure 2.2
Pin Orientation for 26-pin I/O (IOD) Connector



Refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001) for analog output specifications.

Parameters begin with a variable to identify a specific axis by slot number, as follows:

- IAM = 0 for parameters 0-999
- 1st AM = 1 for parameters 1000-1999
- 2nd AM = 2 for parameters 2000-2999 and so on...
- 7th AM = 7 for parameter 7000-7999

Use the two analog output test points to monitor system variables, as shown in the table below.

Analog Output	Controlling Parameter		Scale Parameter	
	Parameter Number[1]	Default Value[1]	Parameter Number[1]	Default Value
1	*x*681	*xx*40	*x*682	0.0060
2	*x*683	*xx*84	*x*684	0.1000

[1] *x* = slot number

The value entered in Scale Parameter will scale the analog output so that you can get a full scale reading of the specific parameter for the dynamic range or values you are testing.

To monitor dynamic system variables on analog outputs, use the values shown in the table below.

Attribute	Parameter Number[4]
Velocity Feedback[1]	*xx*40
Velocity Commanded[1]	*xx*36
Torque Feedback[2]	*xx*84
Torque Commanded[2]	*xx*80
Following Error[3]	*x*189

[1] Velocity Command and Feedback scaling value is 0.25V = 1000 rpm (using default scaling).

[2] Torque Command and Feedback scaling value is 0.25V = 100% rated motor current or amplifier rating (whichever is less) using default scaling.

[3] Output scaling is dependant on feedback device and drive resolution.

[4] *x* = slot number

Replace Kinetix 6000 System Components

Use these procedures to:

- Determine what you need to replace modules
- Remove a module from the Power Rail
- Install a replacement Power Rail module
- Remove the Power Rail
- Install a replacement Power Rail
- Remove the Line Interface Module
- Install a replacement Line Interface Module

ATTENTION

This drive contains ESD (Electrostatic Discharge) sensitive parts and assemblies. You are required to follow static control precautions when you install, test, service, or repair this assembly. If you do not follow ESD control procedures, components can be damaged. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, *Guarding Against Electrostatic Damage* or any other applicable ESD Protection Handbook.

Before You Begin

Before you replace modules, be sure to have the following:

- A flat blade screw driver
- A small flat blade screw driver, 3.5 mm (0.14 in.)
- Voltmeter

Remove Modules from the Power Rail

To remove module(s) from the power rail:

1. Verify that all control and input power has been removed from the system.

ATTENTION

To avoid shock hazard or personal injury, assure that all power has been removed before proceeding. This system may have multiple sources of power. More than one disconnect switch may be required to de-energize the system.

2. Allow five minutes for the DC bus to completely discharge before proceeding.

ATTENTION

This product contains stored energy devices. To avoid hazard of electrical shock, verify that all voltage on capacitors has been discharged before attempting to service, repair, or remove this unit. You should only attempt the procedures in this document if you are qualified to do so and are familiar with solid-state control equipment and the safety procedures in publication NFPA 70E.

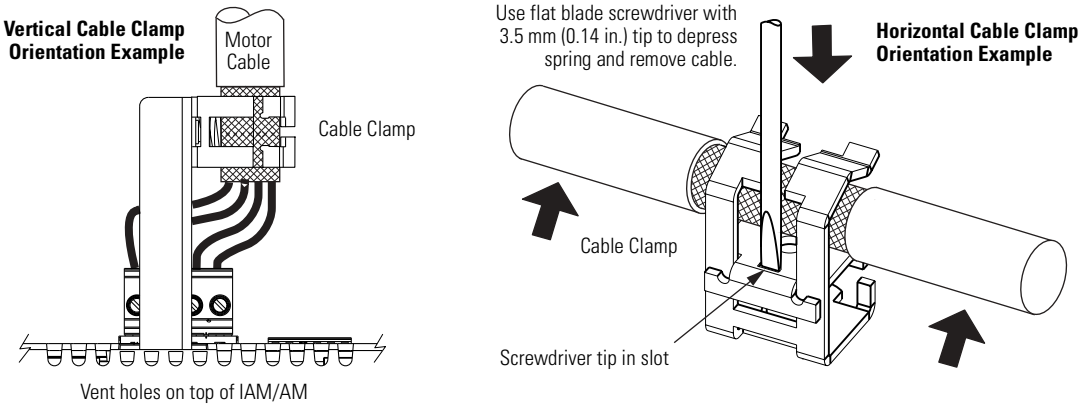
3. Label and remove all connectors from the module (IAM, AM, or SM) you are removing. To identify each connector, refer to *Commission Your Kinetix 6000* (pages 1-3 to 1-5).

   Note: The Slot Filler module has no connectors aside from the connections to the power rail.

4. Remove the motor cable from the cable shield clamp, as shown in the figure below.

Figure 2.3

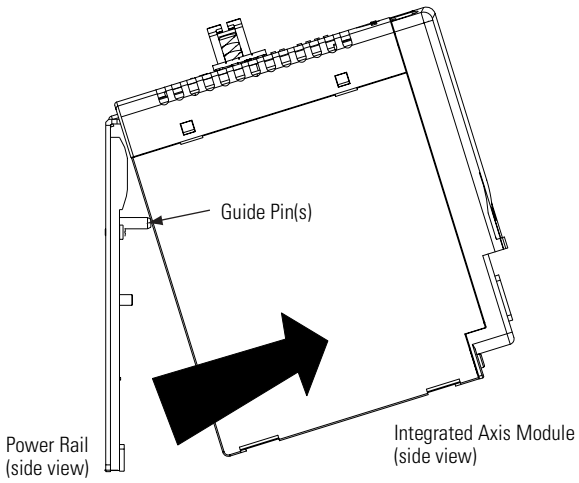
Depressing the Spring Clamp



5. Loosen the mounting screw (bottom center of each module).

6. Grasp top and bottom of the module with both hands and gently pull the module away from the connectors enough to clear the guide pin(s) (module will pivot on top bracket). Lift the bracket out of the power rail slot and remove module from the power rail.

Figure 2.4
Removing Module from Power Rail



Replace Power Rail Modules

To replace the power rail module(s):

1.

If you are	Then
Replacing a power rail module on the existing power rail	Go to step 3.
Replacing a power rail module on a new power rail	Go to step 2.

2. Prepare to mount your replacement module by removing the protective boots from the power rail connector.

3. Hang the mounting bracket from the slot on the power rail.

IMPORTANT Power rail must be in vertical orientation before replacing modules or pins may not seat properly.

4. Align the guide pin(s) on the power rail with the guide pin hole(s) in the back of the module (refer to Figure 2.4).

   Note: The IAM can have two or three power rail connectors and guide pins, the AM can have one or two, all other modules have only one connector and one guide pin.

5. Use 2.26 N-m (20 lb-in.) torque to tighten the mounting screw.

6. Re-connect the module connectors.

7. Re-apply power to the system.

8. Verify that the system is operating properly.

Note: Because IAM and AM parameters reside in the RSLogix 5000 software, you do not need to perform any tuning or setup procedures.

Remove the Power Rail

This procedure assumes you have disconnected all power from the power rail modules and removed all modules from the power rail.

To remove the power rail:

1. Disconnect the braided grounding strap from the grounding stud on the right side of the power rail, as shown in the figures below.

Figure 2.5
Removing Ground Strap (2094-PR*x*)

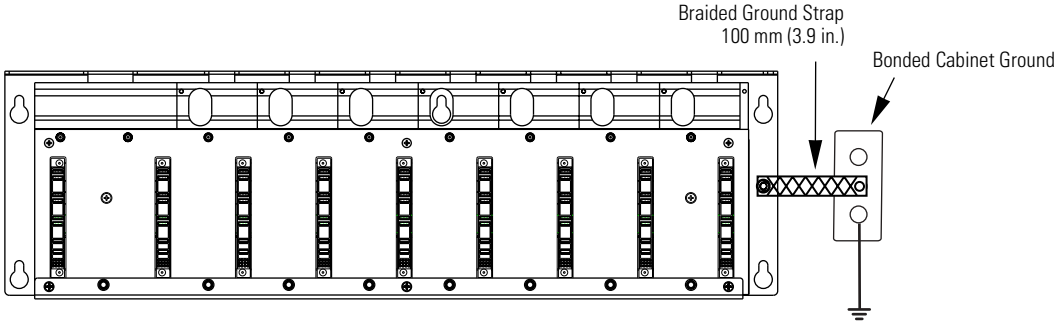
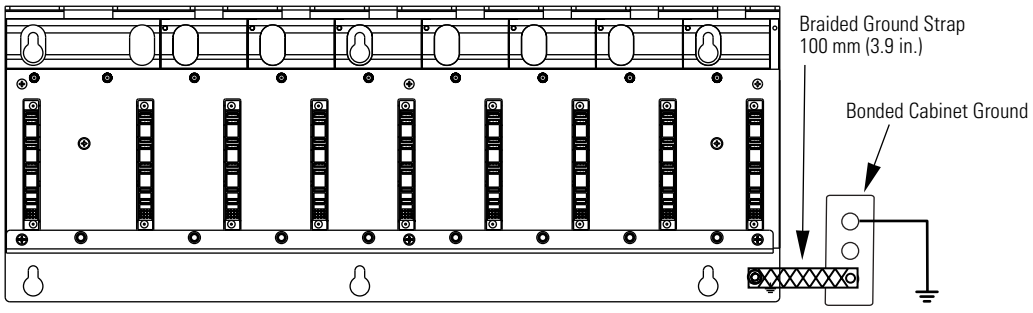


Figure 2.6
Removing Ground Strap (2094-PRS*x*)



2. Loosen the mounting bolts (removing the bolts is not necessary).

3. Lift the power rail up and off of the mounting bolts.

Replace the Power Rail

This procedure assumes you do not need to change the location of the power rail on the panel and you intend to reuse the mounting bolts of the power rail you just removed.

IMPORTANT If you need to change the location of the power rail, or if you are installing a power rail designed for additional or fewer modules than you removed, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001) for complete installation instructions.

ATTENTION

To avoid damage to Power Rail during installation, do not remove the protective boots until the module for each slot is ready for mounting.

To replace the power rail:

1. Align the replacement power rail over the existing mounting bolts.

   IMPORTANT To improve the bond between the power rail and subpanel, construct your subpanel out of zinc plated (paint-free) steel.

2. Tighten the mounting bolts.
3. Re-attach the braided grounding strap to the power rail grounding stud (refer to figures 2.5 and 2.6).

Remove the Line Interface Module

To remove the Line Interface Module (LIM):

1. Verify that all input power has been removed from the LIM.

ATTENTION

To avoid shock hazard or personal injury, assure that all power has been removed before proceeding. This system may have multiple sources of power. More than one disconnect switch may be required to de-energize the system.

2. Allow five minutes for the DC bus to completely discharge before proceeding.

ATTENTION

To avoid hazard of electrical shock, verify that all voltage on the capacitors has been discharged before attempting to service, repair, or remove this unit. This product contains stored energy devices. You should only attempt the procedures in this document if you are qualified to do so and familiar with solid-state control equipment and the safety procedures in publication NFPA 70E.

3. Label and remove all connectors and wires from the LIM. To identify each connector, refer to page 1-6.
4. Loosen the mounting bolts (removing the bolts is not necessary).
5. Lift the LIM up and off of the mounting bolts.

Replace the Line Interface Module

This procedure assumes you do not need to change the location of the LIM on the panel and you intend to reuse the mounting bolts of the LIM you just removed.

IMPORTANT If you need to change the location of the LIM, refer to the *Kinetix 6000 Multi-Axis Servo Drive Installation Manual* (publication 2094-IN001) for complete installation instructions.

1. Align the replacement LIM over the existing mounting bolts.

   IMPORTANT To improve the bond between the LIM and subpanel, construct your subpanel out of zinc plated (paint-free) steel.

2. Tighten the mounting bolts.
3. Re-connect the LIM wires and connectors. To locate wires and connectors, refer to page 1-6.
4. Re-apply power to the LIM.
5. Verify that the LIM is operating properly.

Interconnect Diagrams

Chapter Objectives

This appendix contains the following interconnect diagrams:

- Power Interconnect Diagrams
- DC Common Bus Interconnect Diagrams
- Shunt Module Interconnect Diagrams
- AM/Motor Interconnect Diagrams
- Controlling a Brake Example
- System Block Diagrams

Kinetix 6000 Interconnect Diagram Notes

This section provides interconnect diagram notes to assist you in wiring the Kinetix 6000 system. The notes apply to the interconnect diagrams on the pages that follow.

ATTENTION

The National Electrical Code and local electrical codes take precedence over the values and methods provided. Implementation of these codes is the responsibility of the machine builder.

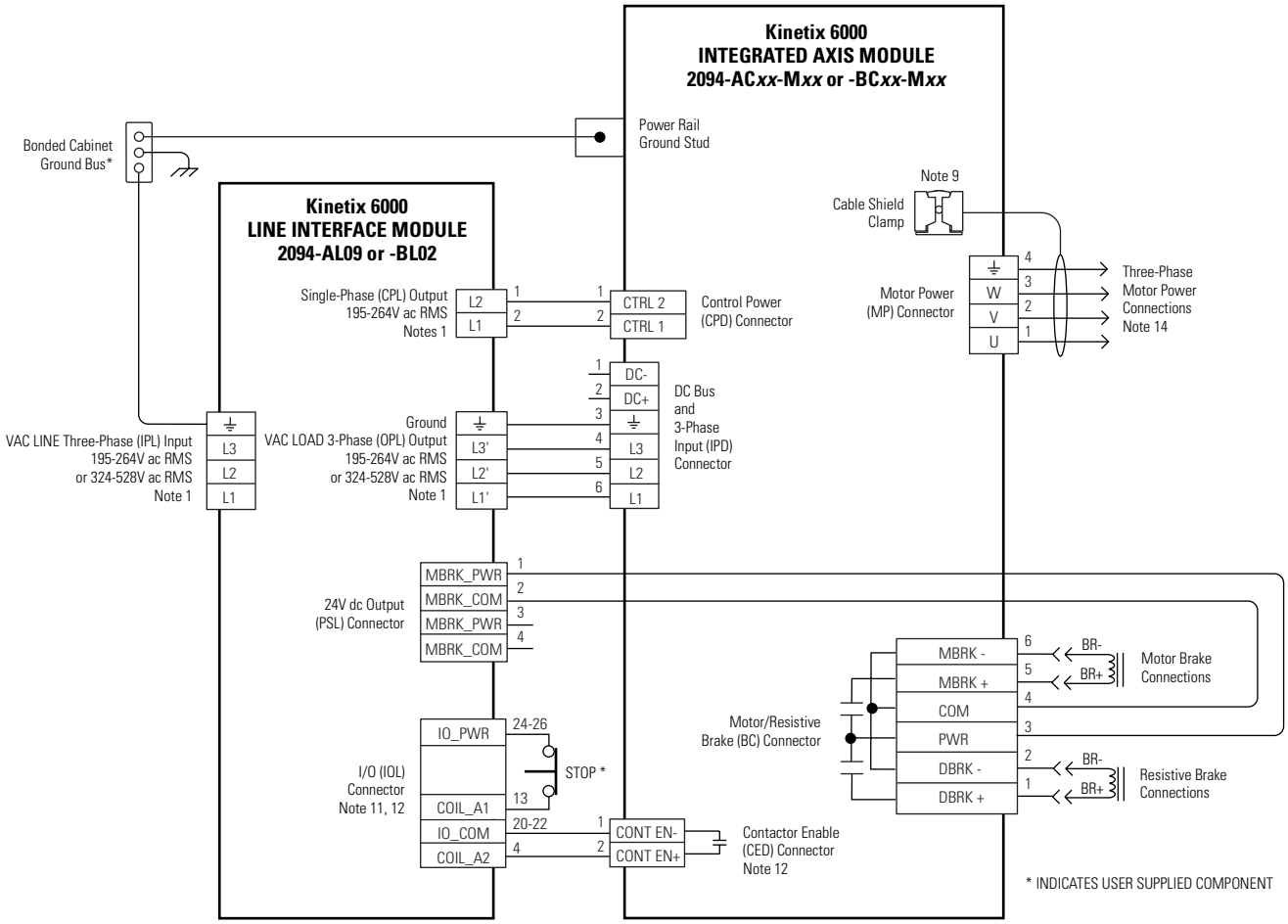
Note	Information
1	For power wiring specifications, refer to *Kinetix 6000 Installation Manual* (publication 2094-IN001).
2	For input fuse and circuit breaker sizes, refer to *Kinetix 6000 Installation Manual* (publication 2094-IN001).
3	For AC line filter specifications, refer to *Kinetix 6000 Installation Manual* (publication 2094-IN001).
4	Terminal block is required to make connections.
5	2094-BC*xx*-M*xx* (460V) IAM requires step down transformer for single-phase control power input. Source 2094-AC*xx*-M*xx* (230V) IAM control power from the three-phase input power (line-to-line). Supplying 230V control power from any other source requires an isolation transformer. If used, do not ground either leg of the isolation transformer output.
6	LIM models 2094-AL75S and -BL75S can supply a maximum of eight axes. LIM models 2094-XL75S-C*x* can supply a maximum of sixteen axes. For common bus systems with more than sixteen axes, multiple LIMs (or control power transformers) are required.
7	Contactor coil (M1) needs integrated surge suppressors for AC coil operation.
8	Drive Enable input must be opened when main power is removed, or a drive fault will occur. A delay of at least 1.0 second must be observed before attempting to enable the drive after main power is restored.
9	Cable shield clamp must be used in order to meet CE requirements. No external connection to ground required.
10	Jumper is factory set, indicating grounded system at user site. Ungrounded sites must jumper the bleeder resistor to prevent high electrostatic buildup. Refer to *Kinetix 6000 Installation Manual* (publication 2094-IN001) for more information.
11	**ATTENTION**  Implementation of safety circuits and risk assessment is the responsibility of the machine builder. Please reference international standards EN 1050 and EN 954 estimation and safety performance categories. For more information refer to *Understanding the Machinery Directive* (publication SHB-900).
12	**ATTENTION**  Wiring the Contactor Enable relay is required. To avoid injury or damage to the drive, wire the Contactor Enable relay into your safety control string. The recommended minimum wire size for wiring the safety circuit to the contactor enable connector is 1.5 mm^2 (16 AWG).
13	The Kinetix 6000 axis module referenced is either an individual axis module (2094-*x*M*xx*) or the same axis module that resides within an integrated axis module (2094-*x*C*xx*-M*xx*).
14	For motor cable specifications, refer to the *Kinetix Motion Control Selection Guide* (publication GMC-SG001).
15	Wire colors are for flying lead cable (2090-XXNF*xx*-S*xx*) and may vary from the premolded connector cable (2090-UXNFB*xx*-S*xx*).
16	Y-Series feedback cables have a drain wire that must be folded back under the Low Profile connector clamp.
17	Only the MPG-B*xxx* encoder uses the +5V dc supply. MPL-B*xxx* encoders use the +9V dc supply.
18	Brake wires on MPF/MPS-A/B5*xx* motors are labeled plus (+) and minus (-). All other MP-Series Food Grade and Stainless Steel motor brake wires are labeled F and G.
19	Refer to *Kinetix 6000 Installation Manual* (publication 2094-IN001) for input fuse specifications. Current requirements are for master only shunt applications. For master/slave applications you must multiply the current requirement by the number of shunt units.
20	Refer to *Kinetix 6000 Installation Manual* (publication 2094-IN001) for fault relay specifications. This normally closed contact (TTL compatible) is closed when 115V ac is applied and opens when a shunt fault or loss of power occurs.

Power Interconnect Diagrams

The interconnect wiring for an IAM is shown beginning below.

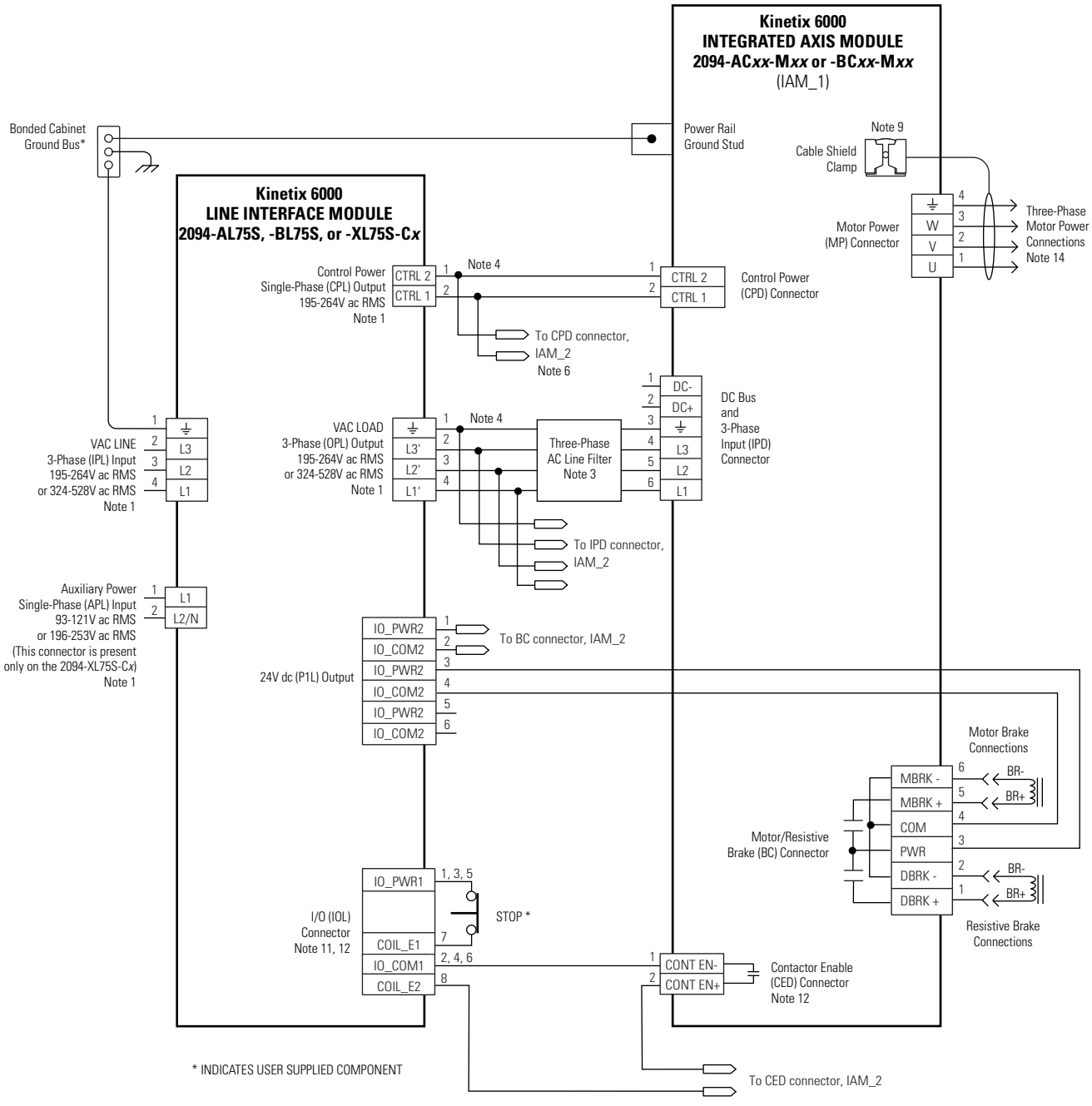
In the configuration below the IAM has input power, brake power, and the start/stop string wired from a LIM (2094-AL09 or -BL02). The 2094-*x*L*xx* LIM contains an AC line filter, so an external filter is not required.

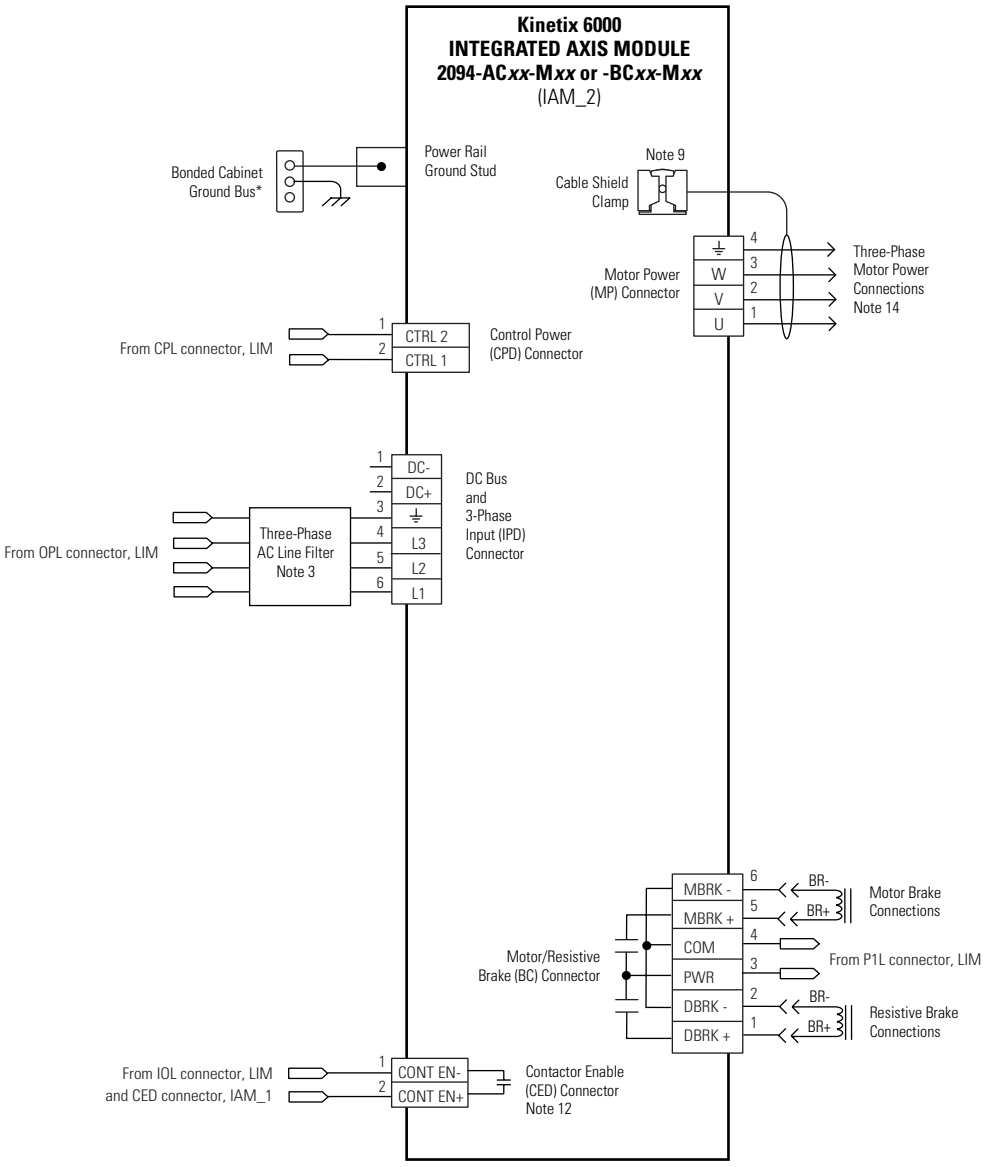
Figure A.1
IAM Power Interconnect Diagram (IAM with LIM)



In the configuration below two IAMs have input power, brake power, and the start/stop string wired from the same LIM (2094-AL75S, -BL75S, or -XL75S-C*x*). The 2094-*x*L75S-*xx* LIM does not contain an AC line filter, so an external filter is added between the LIM and IAM.

Figure A.2
IAM Power Interconnect Diagram (IAM with LIM)



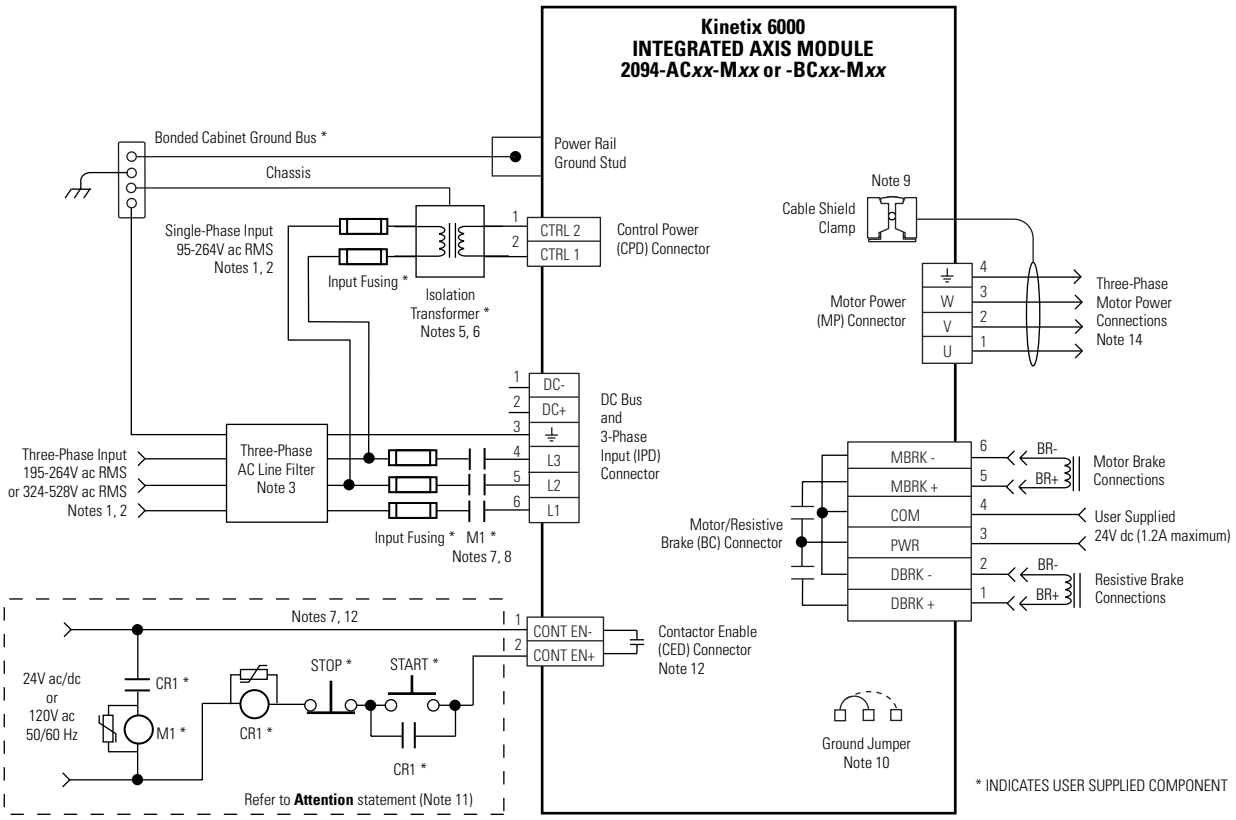

Kinetix 6000
INTEGRATED AXIS MODULE
2094-ACxx-Mxx or -BCxx-Mxx
(IAM_2)
Bonded Cabinet Ground Bus*
Power Rail Ground Stud
Note 9
Cable Shield Clamp
Motor Power (MP) Connector
W
V
U
Three-Phase Motor Power Connections Note 14
From CPL connector, LIM
CTRL 2
CTRL 1
Control Power (CPD) Connector
From OPL connector, LIM
Three-Phase AC Line Filter Note 3
DC-
DC+
L3
L2
L1
DC Bus and 3-Phase Input (IPD) Connector
MBRK -
MBRK +
COM
PWR
DBRK -
DBRK +
BR-
BR+
Motor Brake Connections
Motor/Resistive Brake (BC) Connector
From P1L connector, LIM
Resistive Brake Connections
From IOL connector, LIM and CED connector, IAM_1
CONT EN-
CONT EN+
Contactor Enable (CED) Connector Note 12

The configuration on this page does not include a LIM. You must supply input power components. The diagram below is preferred because one three-phase line filter is utilized by both control power and main input power connections. The three-phase line filter is wired upstream of fusing and the M1 contactor.

ATTENTION

Wiring the Contactor Enable relay is required. To avoid injury or damage to the drive, wire the Contactor Enable relay into your safety control string.

Figure A.3
IAM Power Interconnect Diagram (IAM without LIM - Preferred)

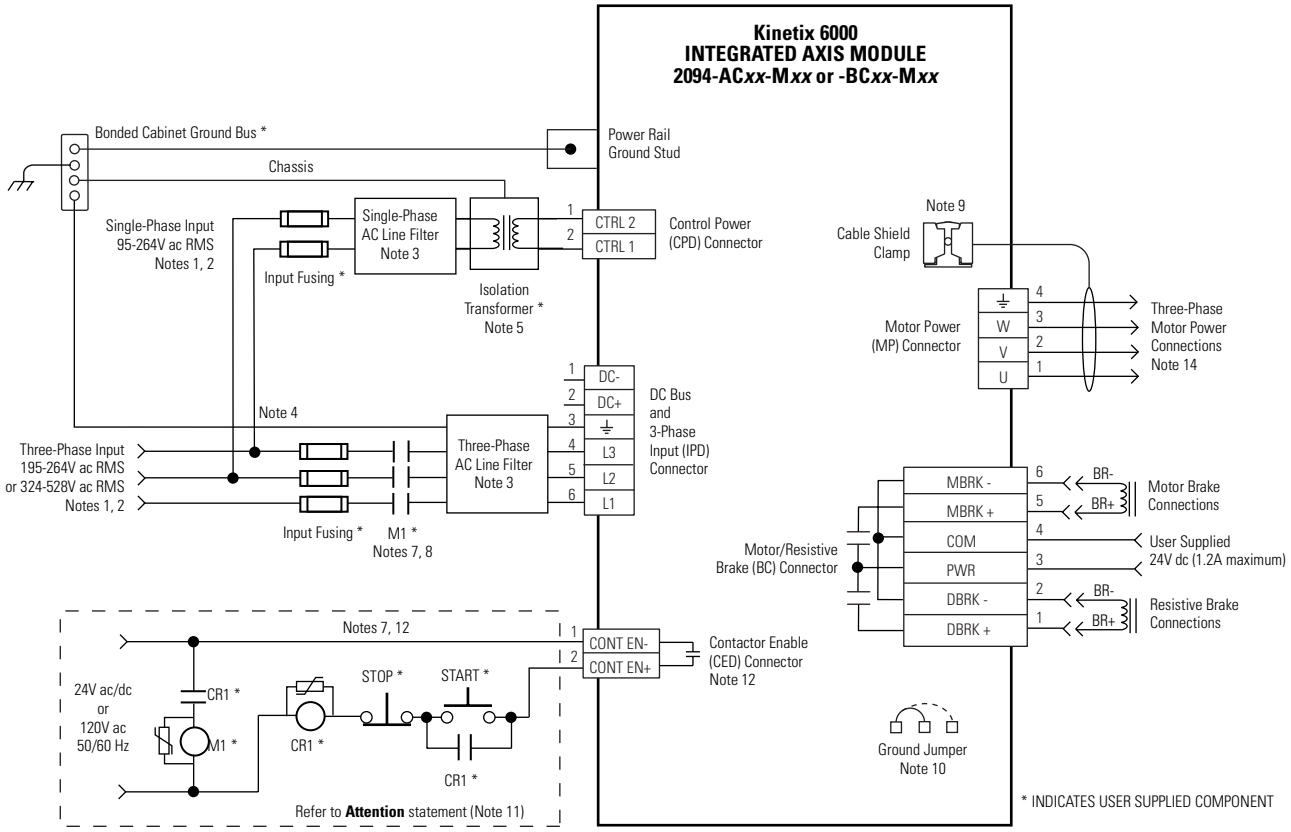


The configuration on this page does not include a LIM. You must supply input power components. The diagram below is not preferred because two line filters are required. The single-phase and three-phase line filters are wired downstream of fusing and the M1 contactor.

ATTENTION

Wiring the Contactor Enable relay is required. To avoid injury or damage to the drive, wire the Contactor Enable relay into your safety control string.

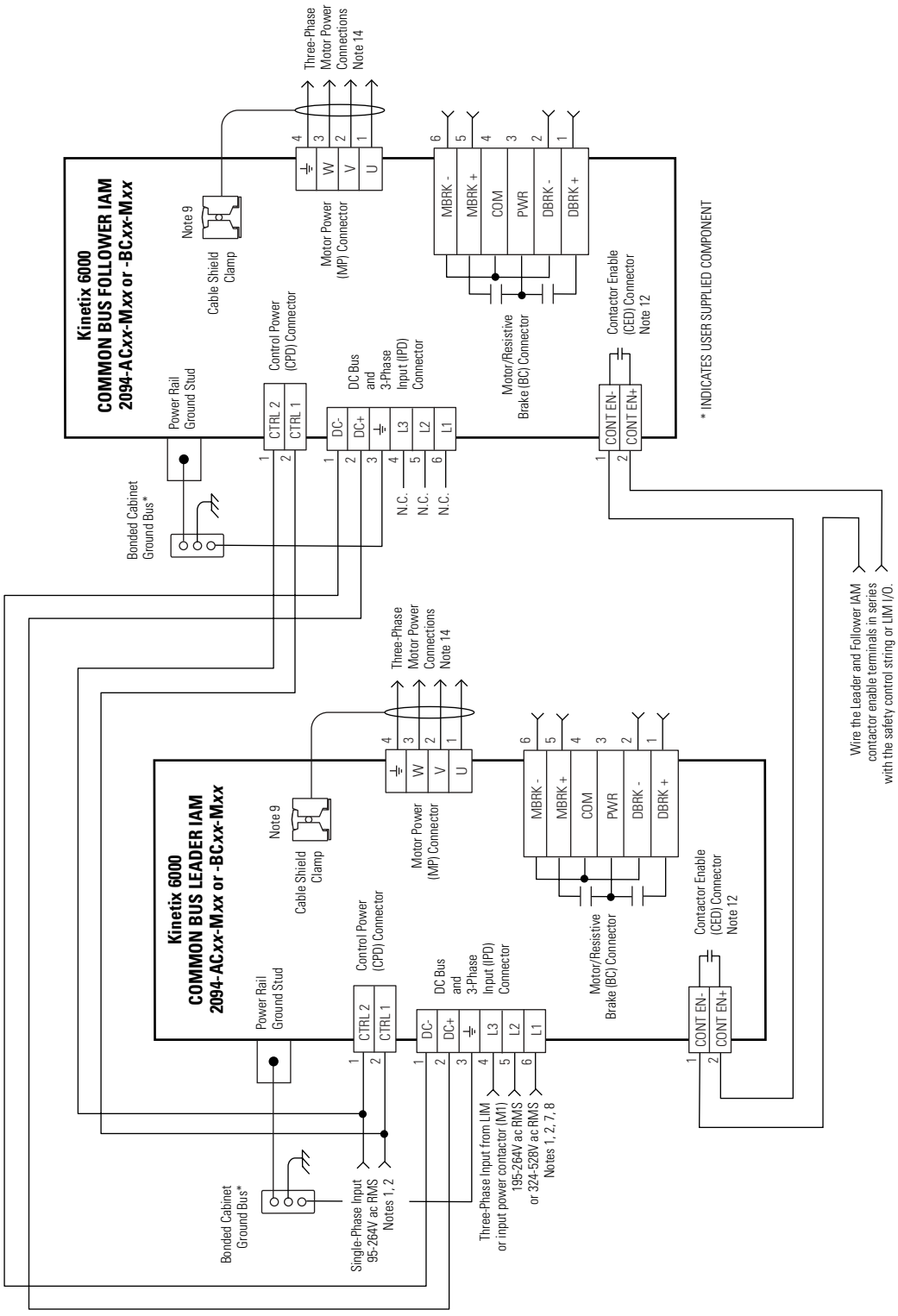
Figure A.4
IAM Power Interconnect Diagram (IAM without LIM - Alternate)



DC Common Bus Interconnect Diagrams

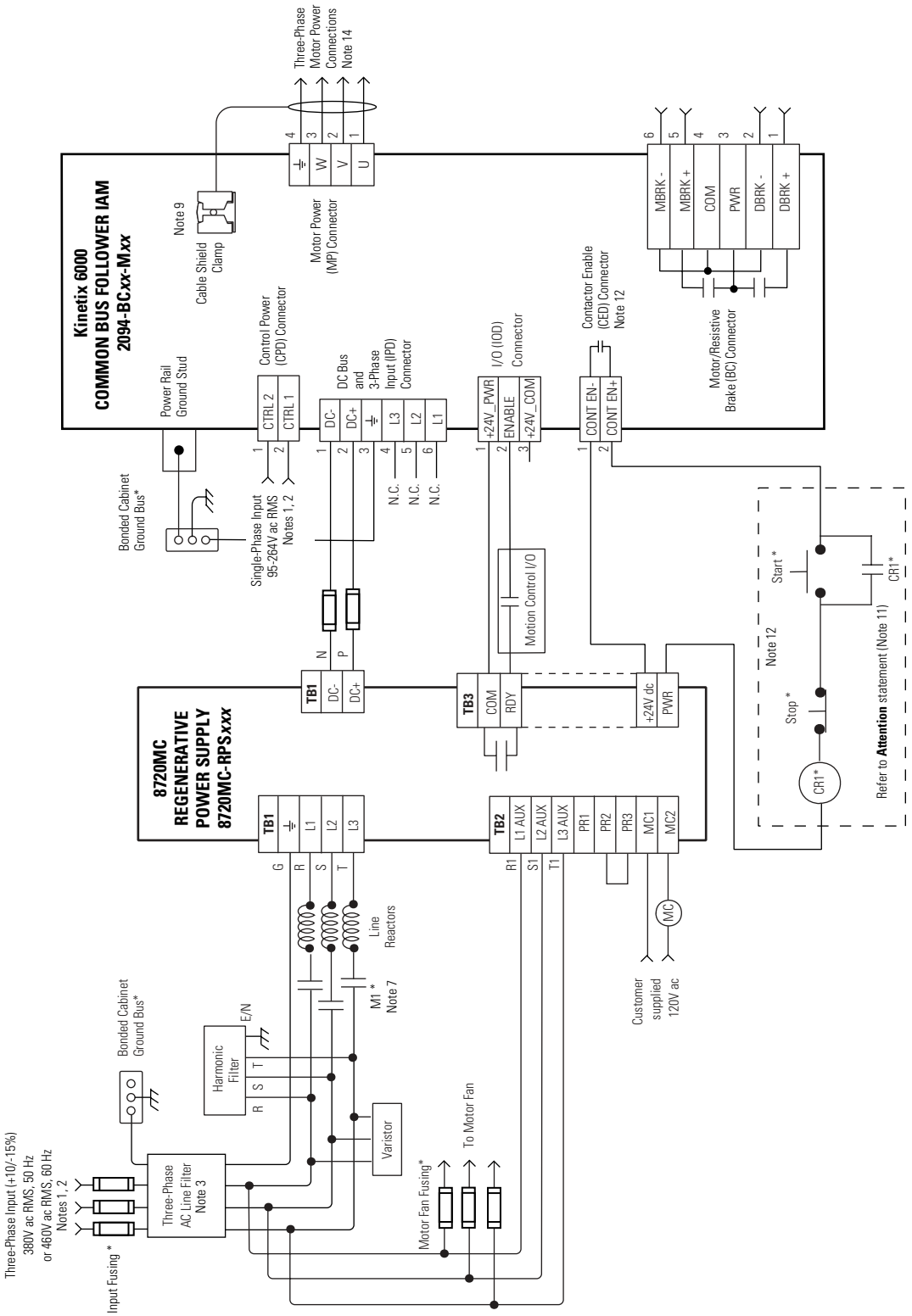
The interconnect wiring for common bus configurations is shown beginning below. The example on this page shows a Kinetix 6000 Leader IAM and Follower IAM connected via the DC common bus.

Figure A.5
Leader IAM with Single Follower IAM Power Interconnect Diagram



In the figure below, the 8720MC-RPS regenerative power supply and Kinetix 6000 (460V) Follower IAM are shown.

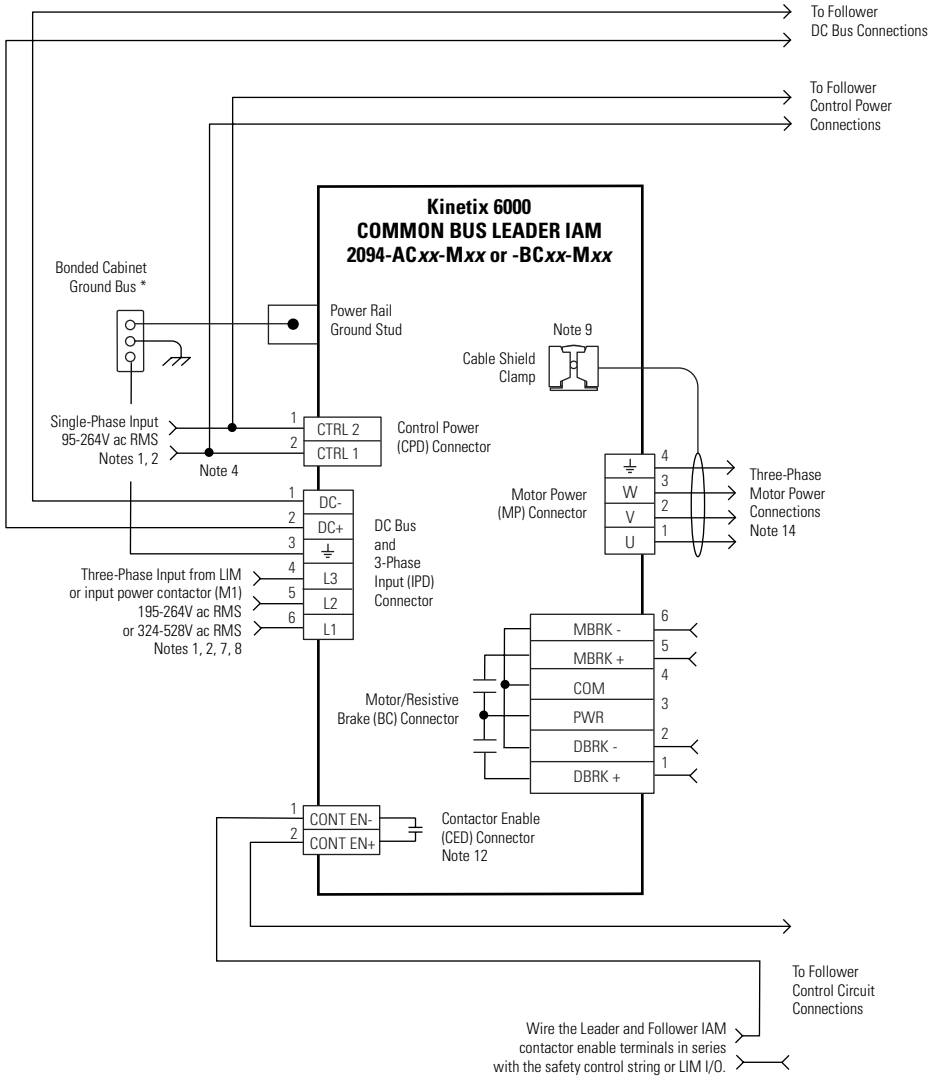
Figure A.6
Non-Kinetix 6000 Leader Drive with Single Follower IAM Power Diagram

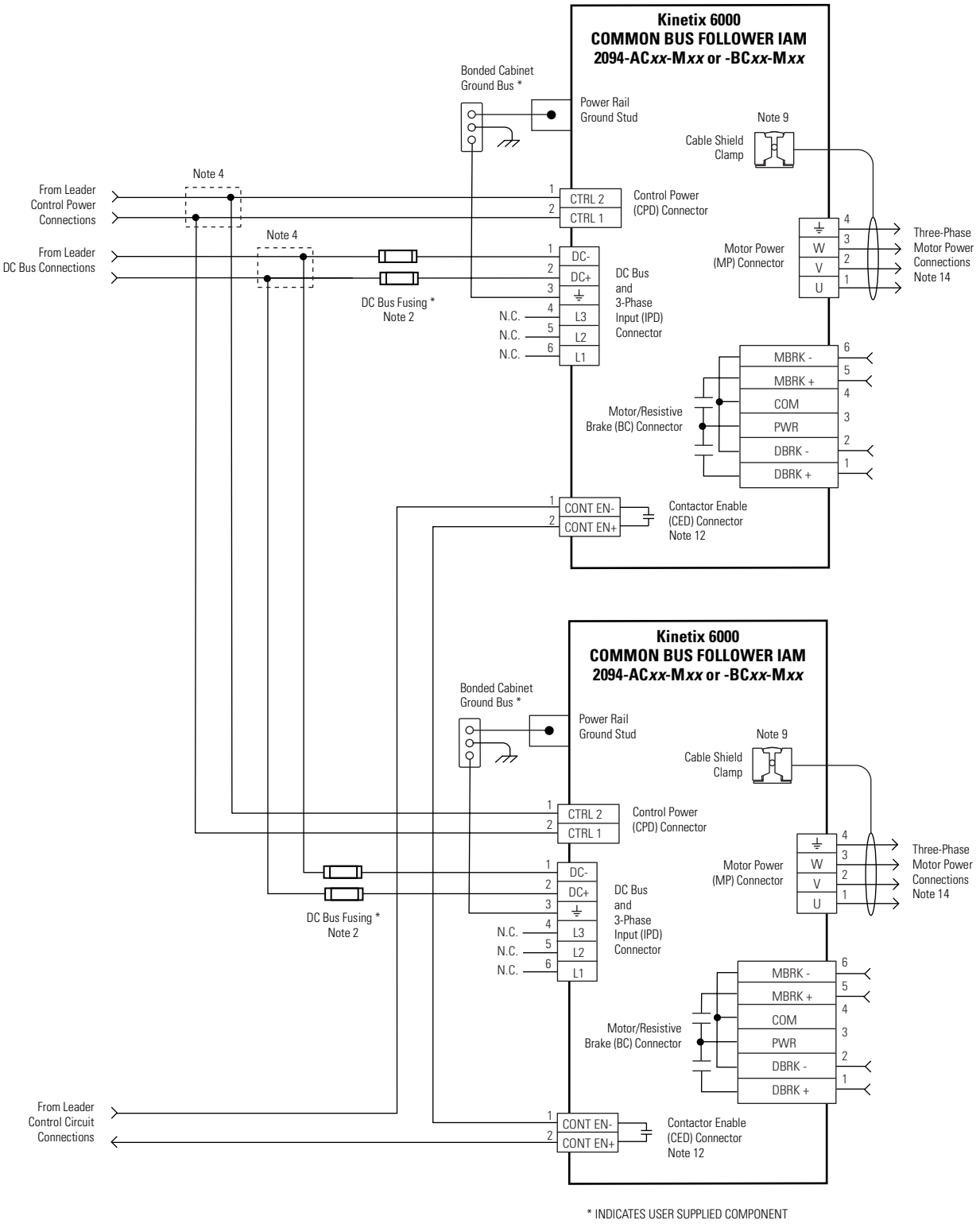


IMPORTANT Use a push-button circuit (instead of a SPST toggle switch) in series with the contactor enable string (between the 8720MC-RPS and Kinetix 6000) to allow a drive fault to remove the DC bus power, and to prevent the drive from applying DC bus power without the user's input after clearing a drive fault.

In the figure below, a Kinetix 6000 Leader IAM is connected to two Follower IAMs via the DC common bus.

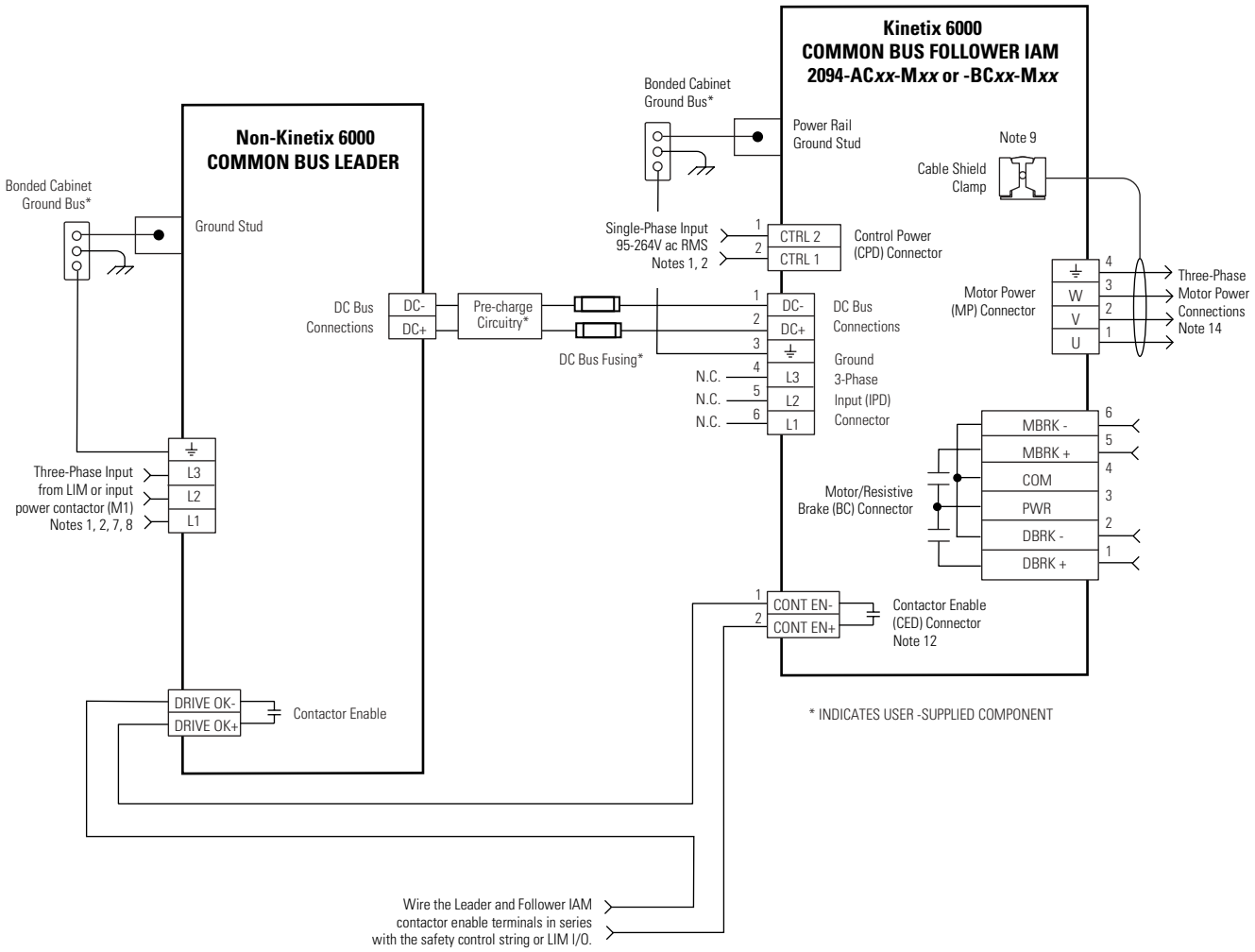
Figure A.7
Leader IAM with Multiple Follower IAM Diagram




Kinetix 6000
COMMON BUS FOLLOWER IAM
2094-ACxx-Mxx or -BCxx-Mxx
Bonded Cabinet Ground Bus *
Power Rail Ground Stud
Note 9
Cable Shield Clamp
Note 4
From Leader Control Power Connections
From Leader DC Bus Connections
CTRL 2
CTRL 1
Control Power (CPD) Connector
DC-
DC+
L3
L2
L1
N.C.
DC Bus and 3-Phase Input (IPD) Connector
DC Bus Fusing * Note 2
Motor Power (MP) Connector
W
V
U
Three-Phase Motor Power Connections Note 14
MBRK -
MBRK +
COM
PWR
DBRK -
DBRK +
Motor/Resistive Brake (BC) Connector
CONT EN-
CONT EN+
Contactor Enable (CED) Connector Note 12
From Leader Control Circuit Connections
* INDICATES USER SUPPLIED COMPONENT

In the figure below, a non-Kinetix 6000 leader drive and Kinetix 6000 Follower IAM are shown.

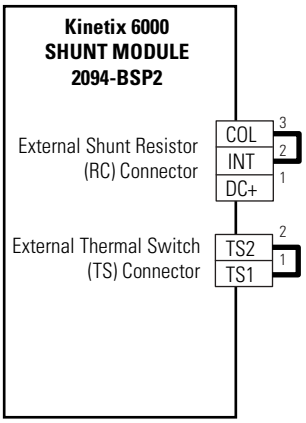
Figure A.8
Non-Kinetix 6000 Leader Drive with Single Follower IAM Power Diagram



Shunt Module Interconnect Diagrams

In the figure below, the Kinetix 6000 Shunt Module is shown wired for internal shunt operation. This is the factory default jumper setting.

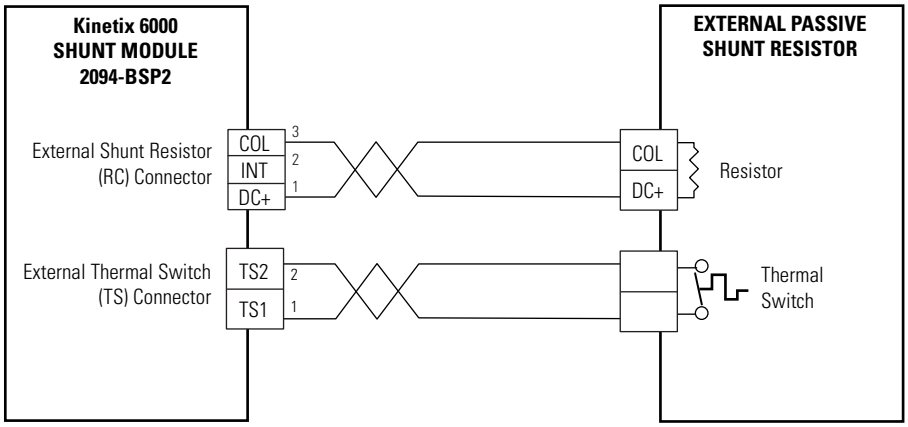
Figure A.9
Internal Shunt Module Interconnect Diagram



In the figure below, the Kinetix 6000 shunt module is shown wired with an external passive shunt resistor.

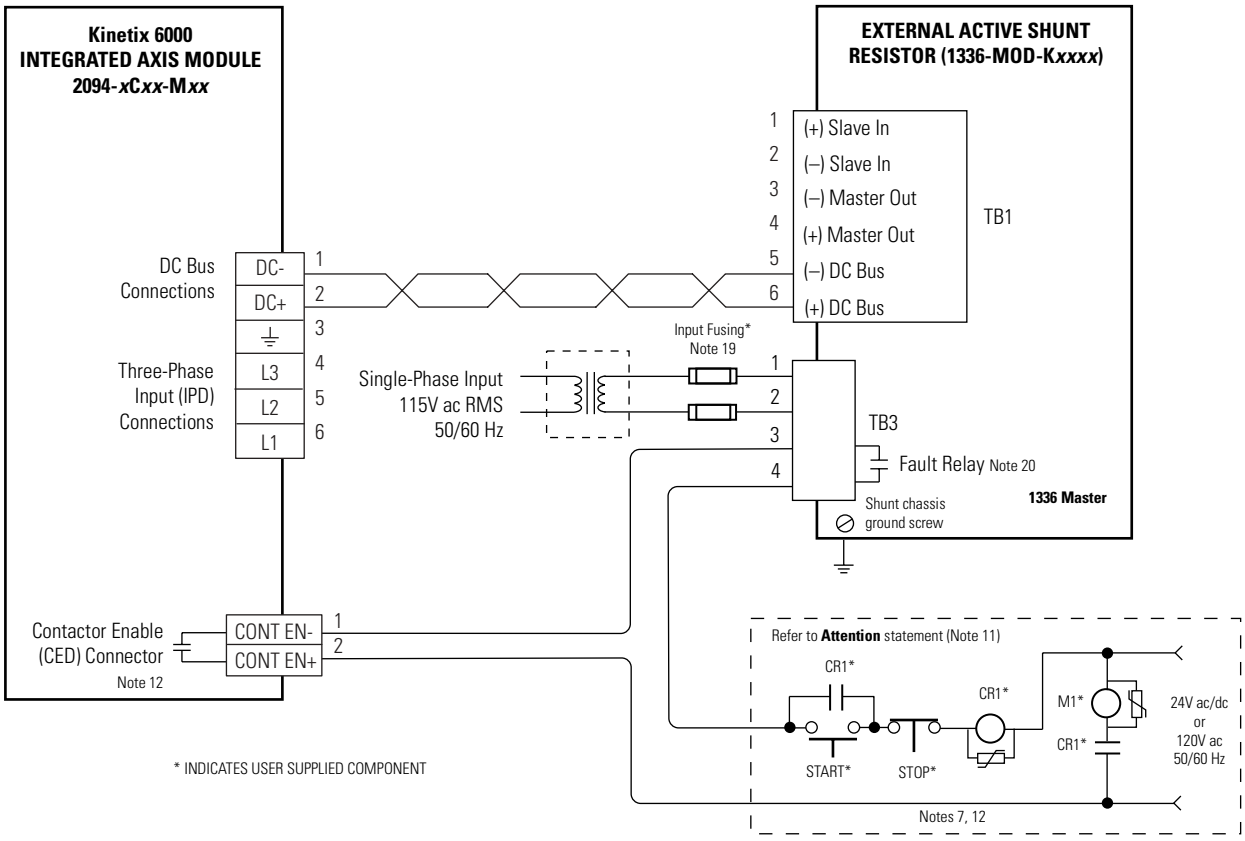
IMPORTANT Only passive shunts with a thermal switch are wired to the TS connector on the Kinetix 6000 shunt module. If your external passive shunt does not have a thermal switch, leave the factory installed jumper in place on the TS connector.

Figure A.10
External Passive Shunt Module Interconnect Diagram



In the figure below, the Kinetix 6000 IAM (without the LIM) is shown wired with a Bulletin 1336 external active shunt.

Figure A.11
External Active Shunt Module Interconnect Diagram



1336 Active Shunt Input Fuse Specifications

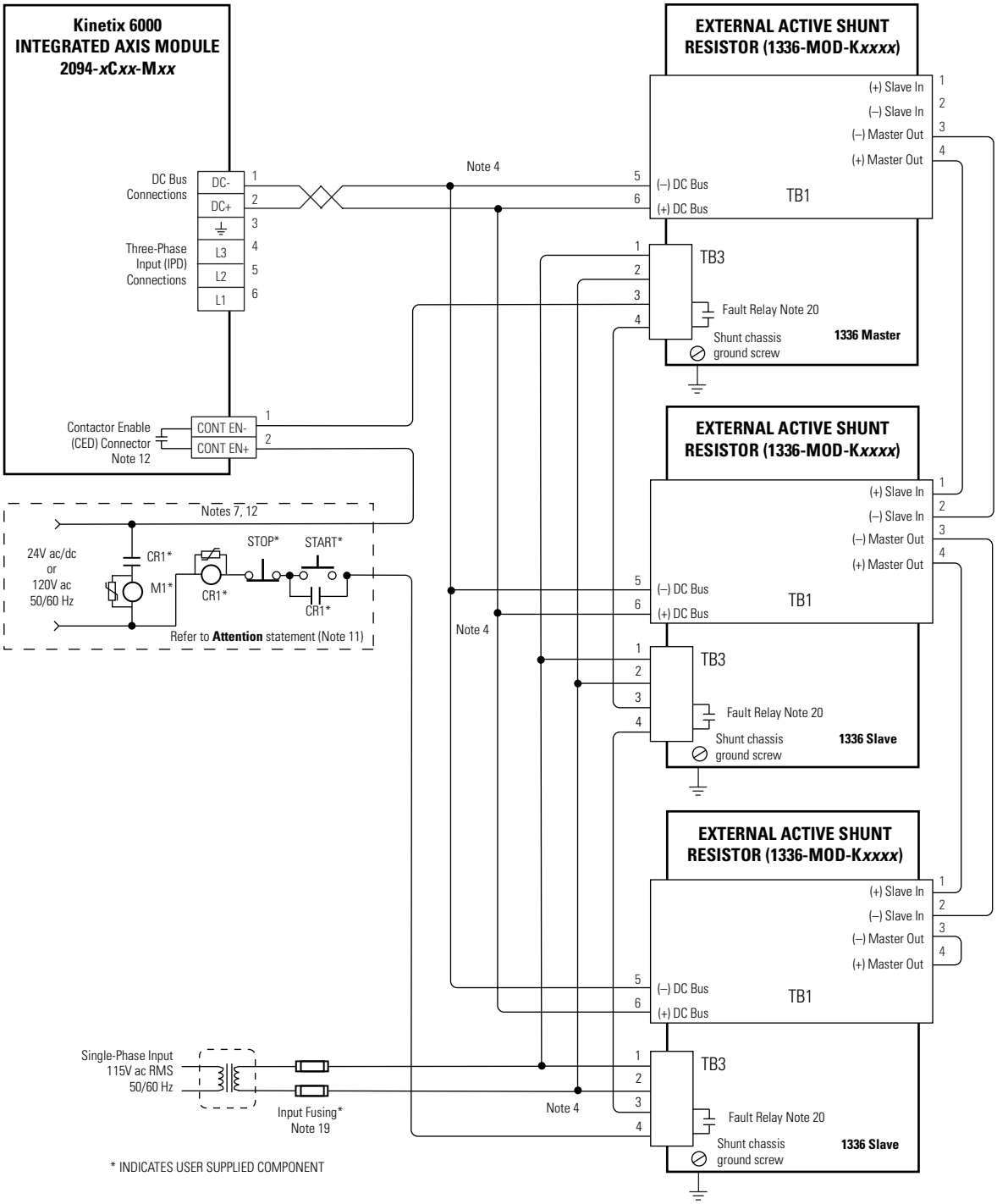
Active Shunt Module 1336-	Description	Input Current Requirements
K*x*005 or K*x*010	Input current requirement to power logic for fault contact operation.	0.05A
KB050	Input current requirement to power fan and logic for fault contact operation.	0.65A

1336 Active Shunt Fault Relay Specifications

Parameter	Description	120V ac	30V ac
On State Current	Current flow when the contact is closed	0.6A	2.0A
On State Resistance	Contact resistance (maximum)	50 mOhms	50 mOhms
Off State Voltage	Voltage across the contacts when the relay is open	120V ac	30V ac

In the figure below, the Kinetix 6000 IAM is shown (without a LIM) wired with a Bulletin 1336 external active shunt (master) and two slave units.

Figure A.12
External Active Shunt Module Interconnect Diagram

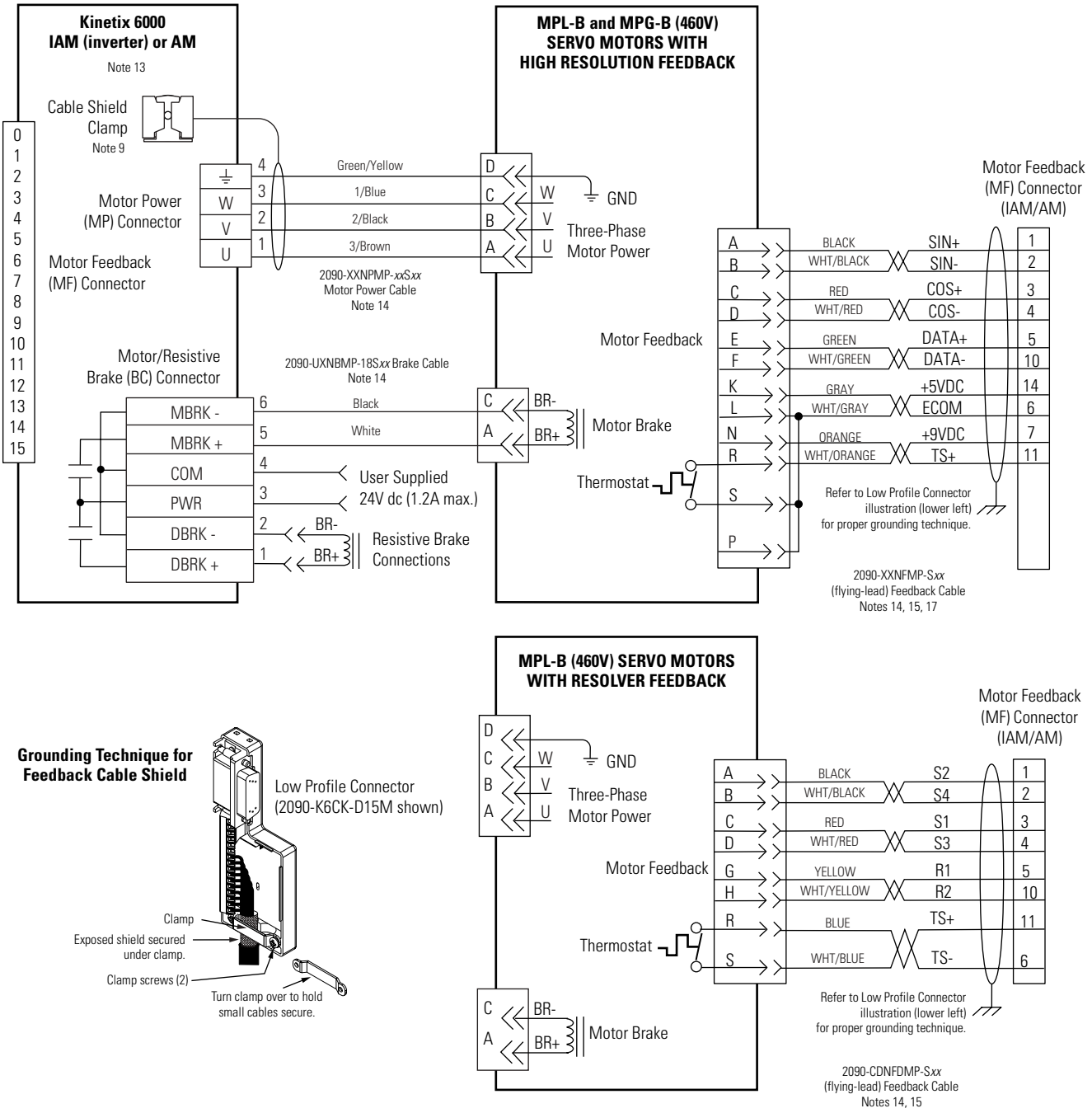


AM/Motor Interconnect Diagrams

This section contains the motor power, brake, and feedback signal interconnect diagrams between an Axis Module and MP-Series, 1326AB, or F-, H-, N-, and Y-Series servo motors.

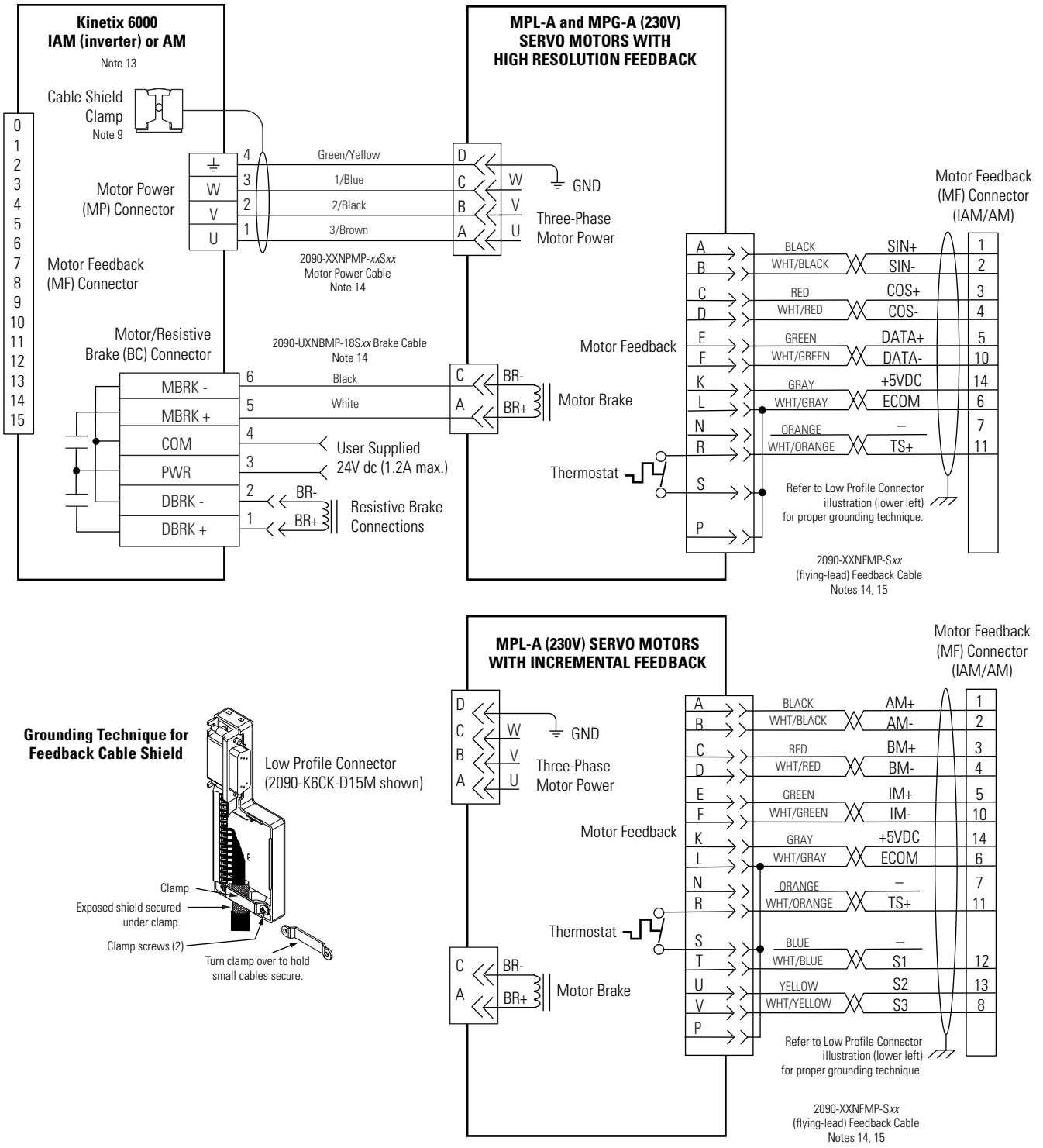
In the figure below, the Kinetix 6000 axis module (460V) is shown connected to MP-Series Low Inertia and Integrated Gear (460V) motors.

Figure A.13
Axis Module to MP-Series (460V) Motor Interconnect Diagram



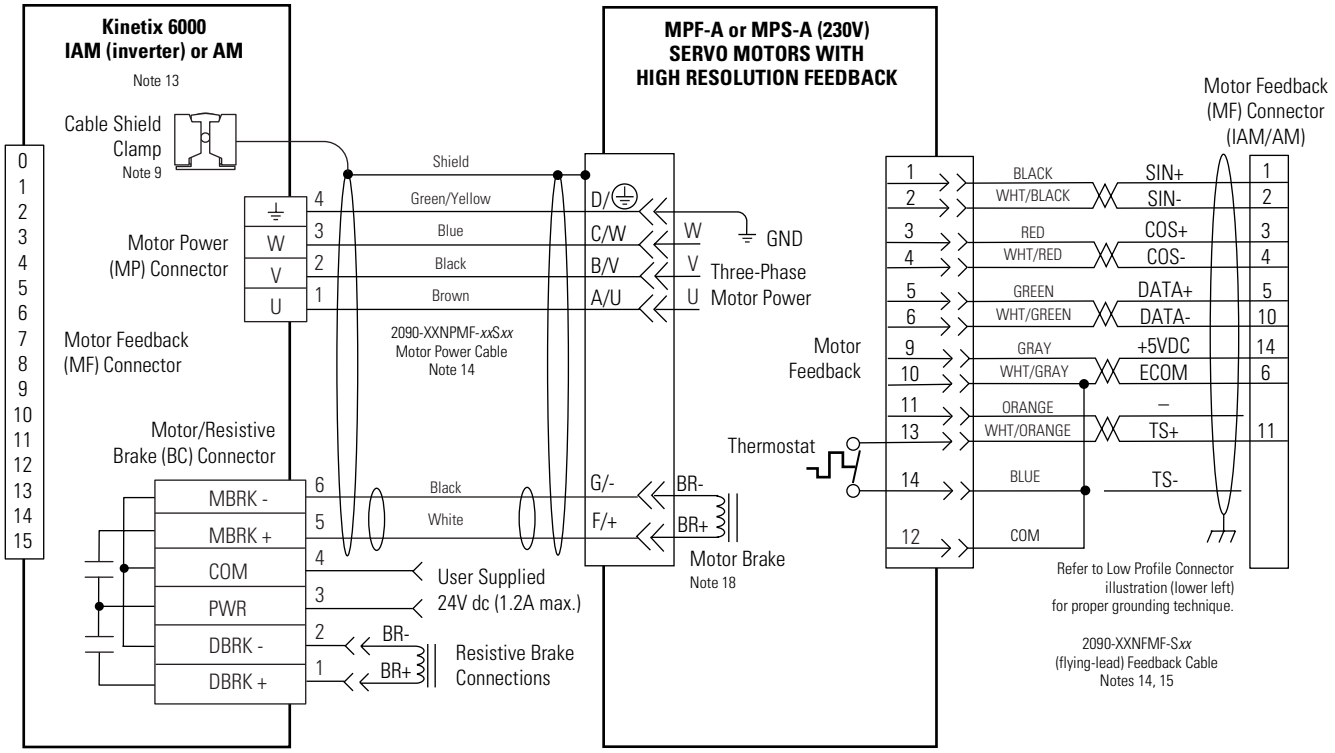
In the figure below, the Kinetix 6000 axis module (230V) is shown connected to MP-Series Low Inertia (MPL) and Integrated Gear (MPG) 230V servo motors.

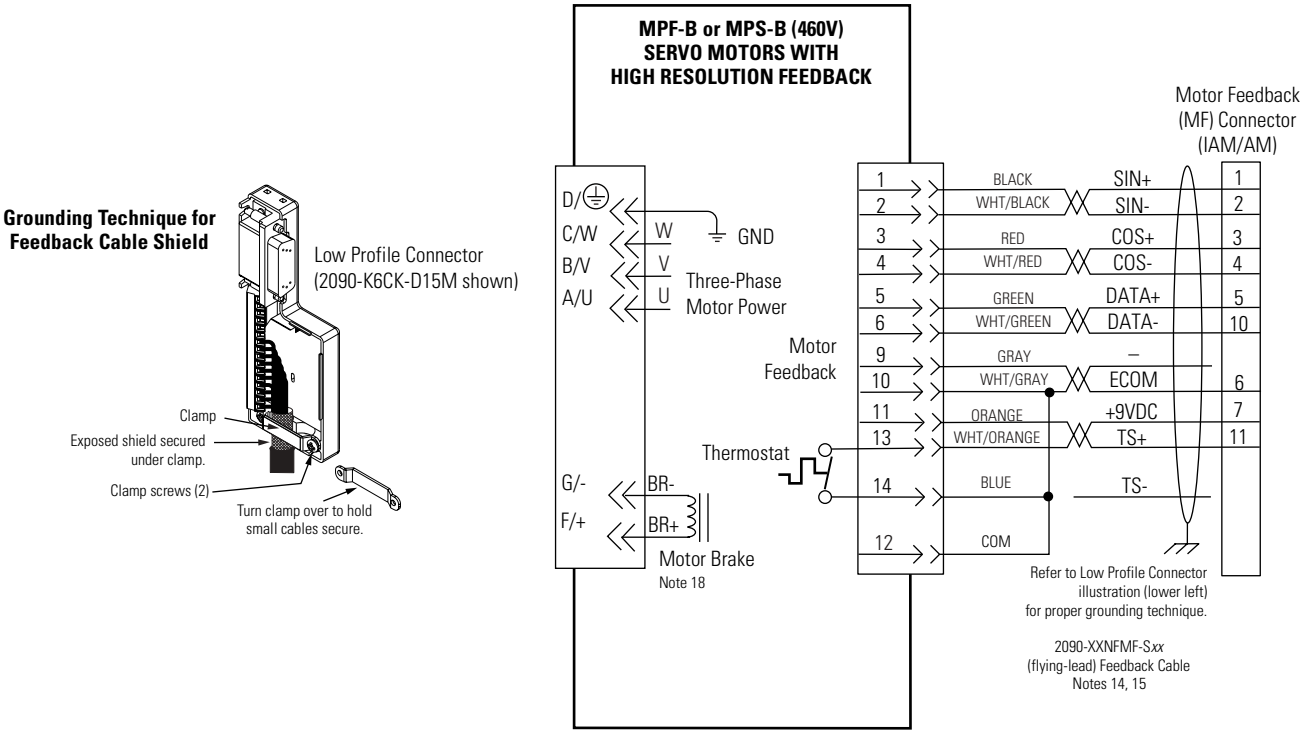
Figure A.14
Axis Module to MP-Series (230V) Motor Interconnect Diagram



In the figure below, the Kinetix 6000 axis module is shown connected to MP-Series Food Grade (MPF) and MP-Series Stainless Steel (MPS) servo motors.

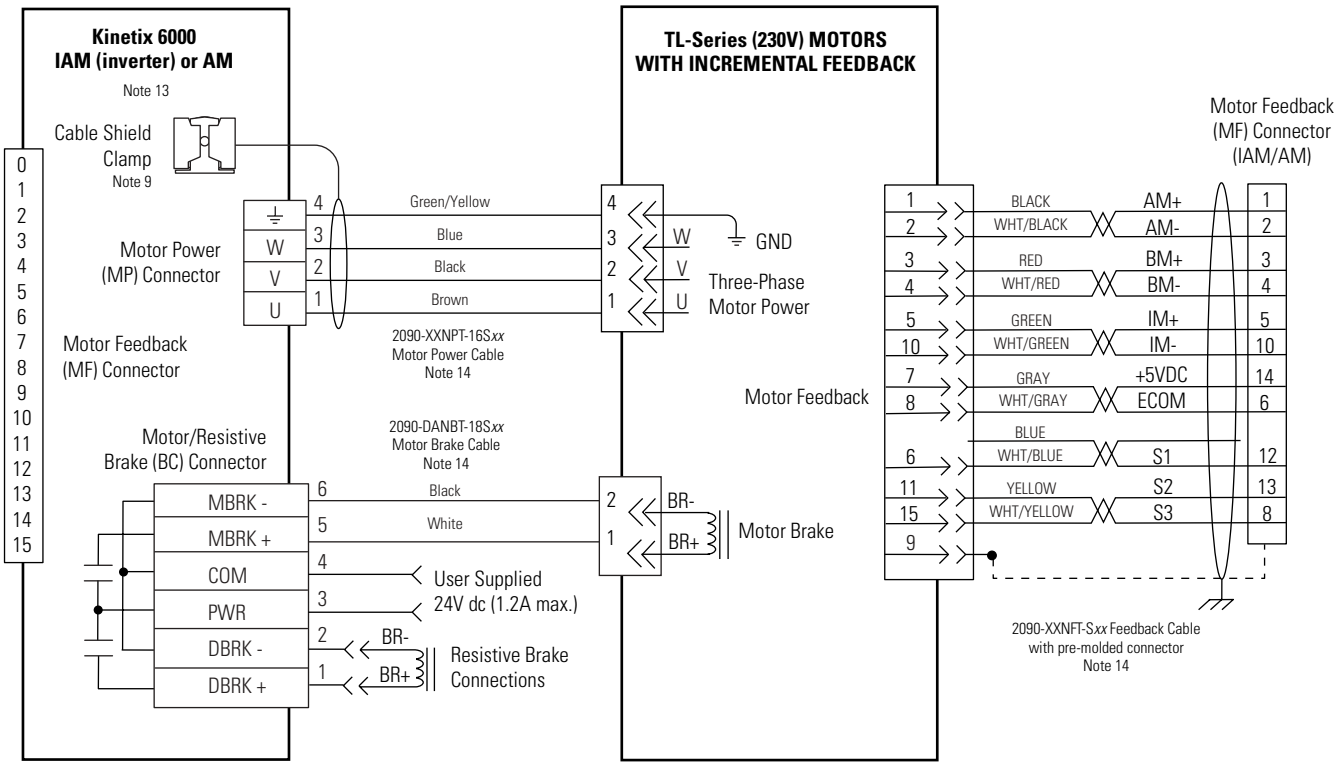
Figure A.15
Axis Module to MP-Series Food Grade and Stainless Steel Motors





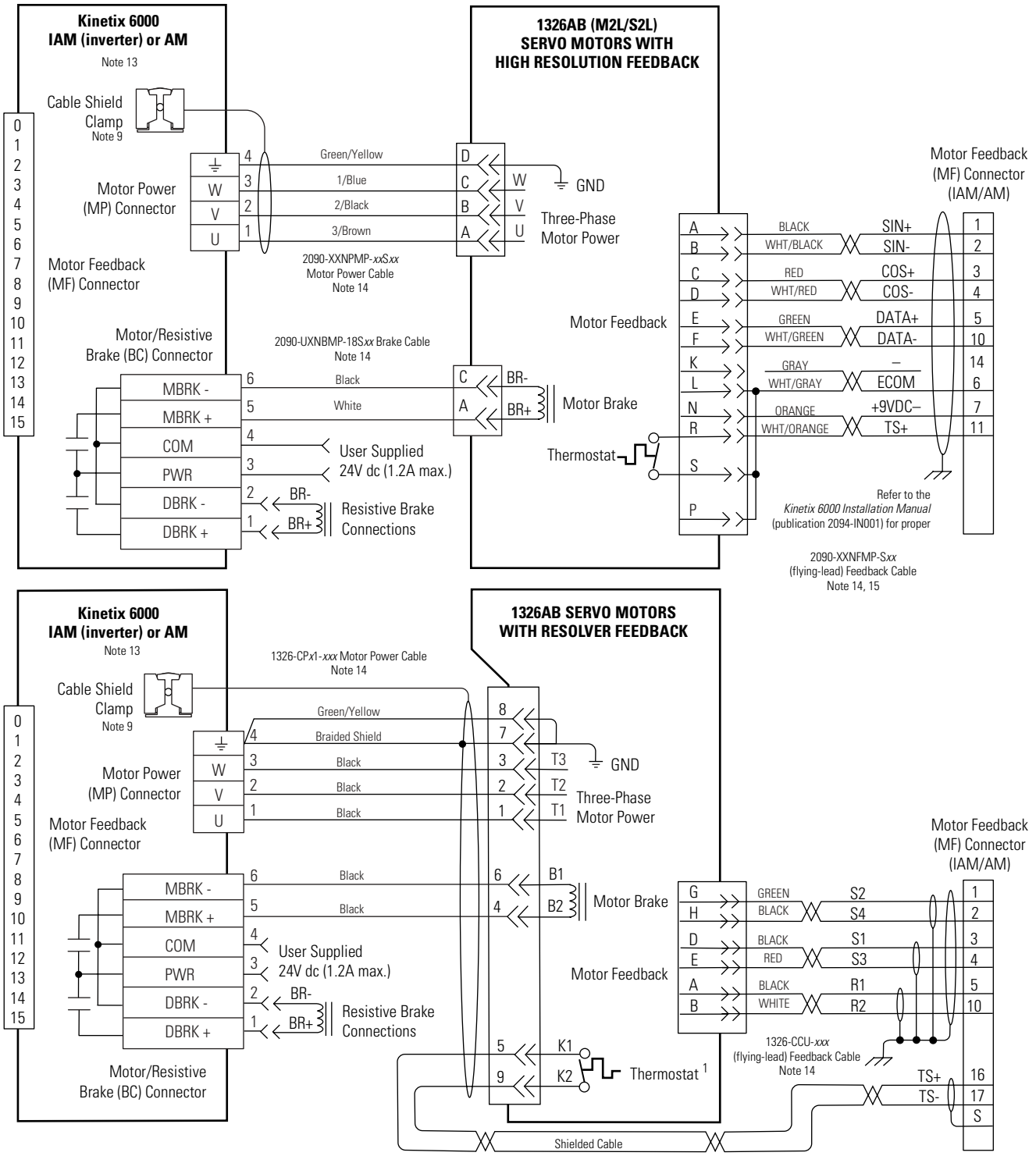
In the figure below, the Kinetix 6000 axis module (230V) is shown connected to TL-Series (230V) servo motors.

Figure A.16
Axis Module to TL-Series (230V) Motor Interconnect Diagram



In the figure below, the Kinetix 6000 axis module (460V) is shown connected to 1326AB-B*xxxx* (460V) servo motors.

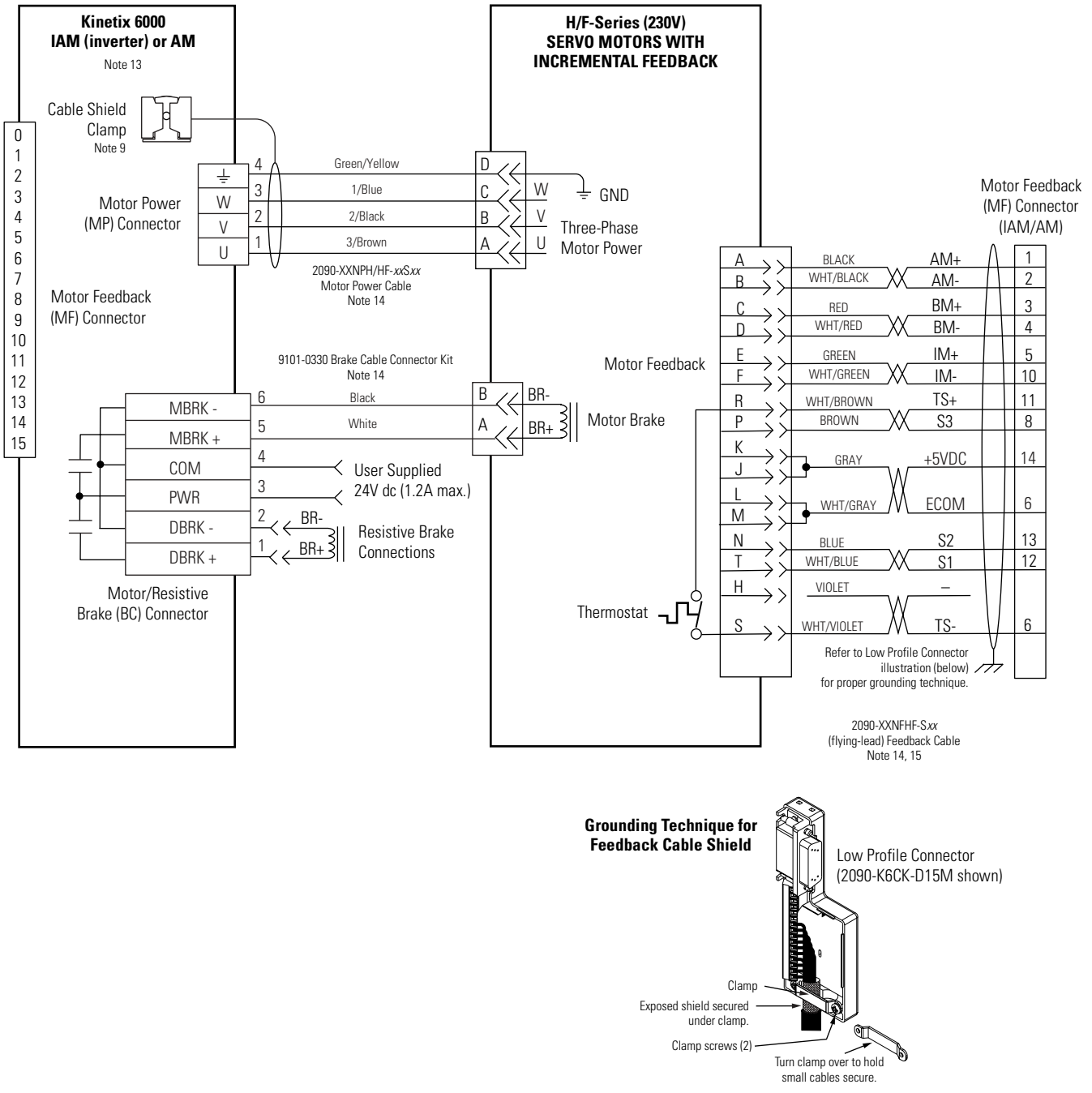
Figure A.17
Axis Module to 1326AB Motor Interconnect Diagram



[1] Wiring the thermal switch on 1326AB (resolver-based) motors requires the use of the Low Profile connector kit (2090-K6CK-D15MF) and wire extension to the power connector. Pins 16, 17, and S are filtered to prevent noise transmission back to the drive. Refer to the *Kinetix 6000 Installation Manual* (publication 2094-IN001) for wiring instructions and a diagram.

In the figure below, the Kinetix 6000 axis module (230V) is shown connected to H- and F-Series (230V) servo motors.

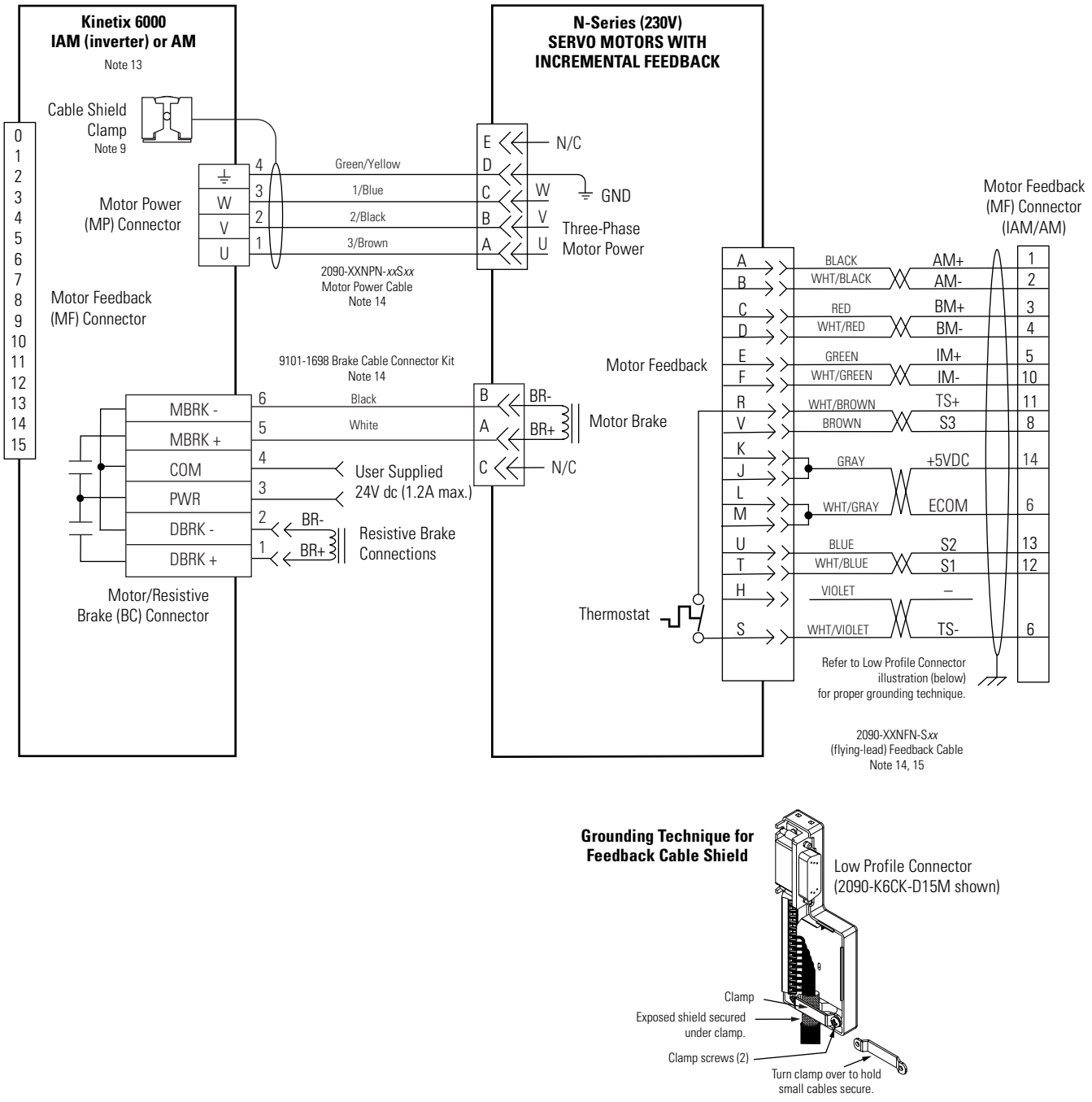
Figure A.18
Axis Module to H/F-Series Motor Interconnect Diagram



Grounding Technique for Feedback Cable Shield

In the figure below, the Kinetix 6000 axis module (230V) is shown connected to N-Series (230V) servo motors.

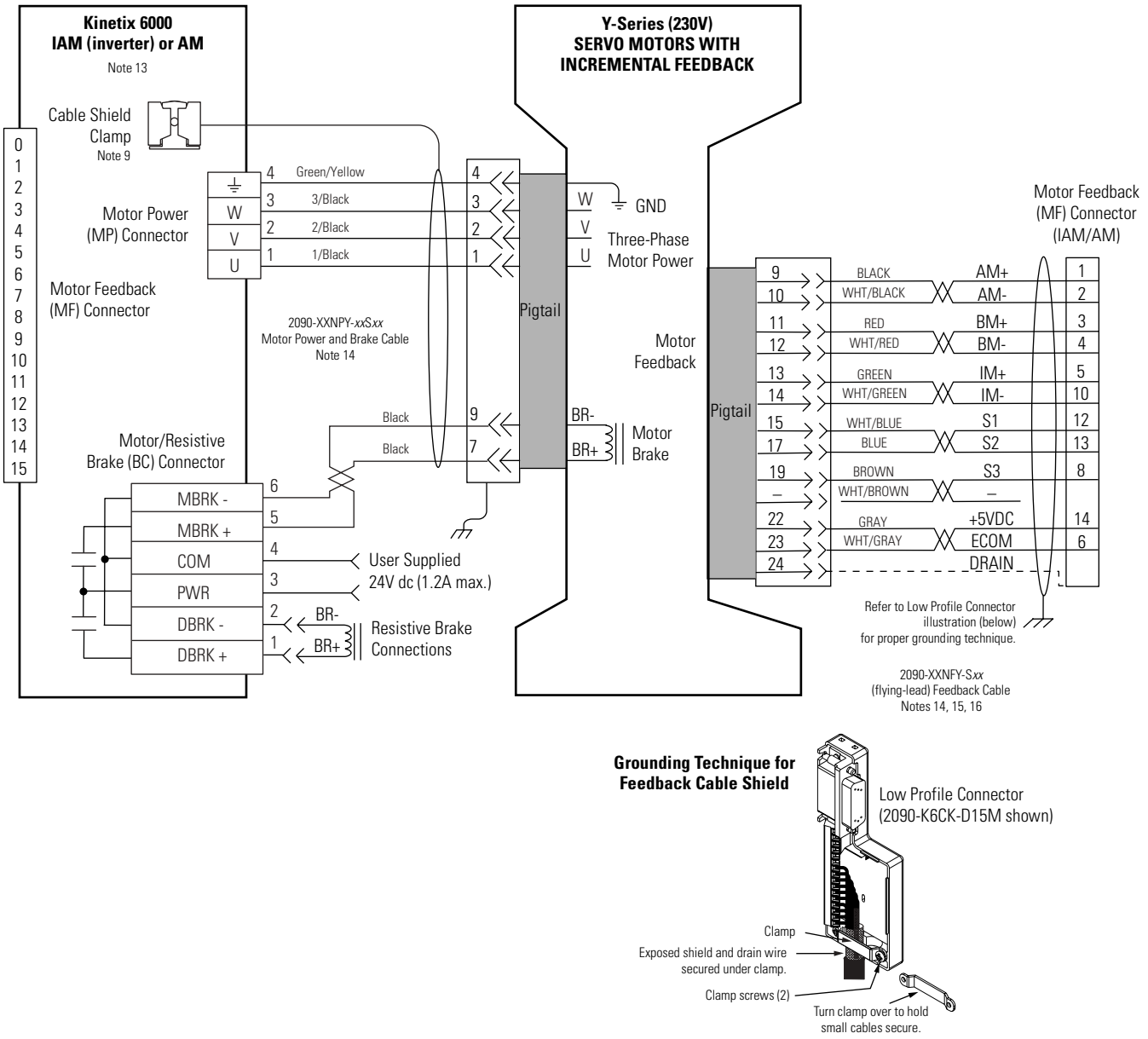
Figure A.19
Axis Module to N-Series Motor Interconnect Diagram



Grounding Technique for Feedback Cable Shield

In the figure below, the Kinetix 6000 axis module (230V) is shown connected to Y-Series (230V) servo motors.

Figure A.20
Axis Module to Y-Series Motor Interconnect Diagram



Controlling a Brake Example

The relay output of the Kinetix 6000 (MBRK± BC-5 and -6) is suitable for directly controlling a motor brake, subject to the relay voltage limit of 30V dc, and the relay current limit as shown in the table below.

Kinetix 6000 IAM/AM	Maximum Brake Current Rating
2094-AC05-M*xx*, -AC09-M*xx*, 2094-AMP5, -AM01, -AM02	1.0A
2094-BC01-M*xx*, -BC02-M*xx*, 2094-BMP5, -BM01, -BM02	
2094-AC16-M*xx*, -AC32-M*xx*, 2094-AM03, -AM05	1.3A
2094-BC04-M*xx*, -BC07-M*xx*, 2094-BM03, -BM05	3.0A

IMPORTANT For brake requirements outside of these limits, an external relay must be used (refer to Figure A.21 for an example).

The following tables list Allen-Bradley motors and brake coil current ratings.

Coil Currents Rated at < 1.0A

Compatible Brake Motors	Coil Current
F-4030, -4050, and -4075	0.69A
H-3007 and -3016	0.60A
H-4030, -4050, and -4075	0.69A
N-2302, and -2304	0.28A
N-3406, -3412, -4214, and -4220	0.36A
N-5630, -5637, and -5647	0.71A
Y-1002 and -1003	0.26A
Y-2006 and -2012	0.31A
Y-3023	0.37A
TL-A110P-H, -A120P-H, and -A130P-H	0.208A
TL-A220P-H and -A230P-H	0.375A
TL-A2530P-H and -A2540P-H	0.396A
TL-A410P-H	0.746A

Coil Currents Rated at < 1.0A

Compatible Brake Motors	Coil Current
MPL/MPF/MPS-*x*310, -*x*320, -*x*330 [1]	0.50A
MPL-*x*420, -*x*430, -*x*4520, -*x*4530, -*x*4540 [1]	0.64A
MPF-*x*430, -*x*4530, -*x*4540 [1]	
MPG-*x*004 [1]	0.33A
MPG-*x*010 [1]	0.45A
MPG-*x*025 [1]	
MPG-*x*050 [1]	0.50A
MPG-*x*110 [1]	1.0A
1326AB-B4*xxx*	0.88A

[1] Applies to 230V and 460V motors.

Coil Currents Rated >1.0A and ≤1.3A	
Compatible Brake Motors	**Coil Current**
F-6100, -6200, and -6300	1.30A
H-6100, -6200, and -6300	1.13A

Coil Currents Rated >1.0A and ≤1.3A	
Compatible Brake Motors	**Coil Current**
MPL-*x*520, -*x*540, -*x*560, -*x*580 [1]	1.05 to 1.28A
MPF-B540	
1326AB-B5*xxx*, and -B7*xxx*	1.20A

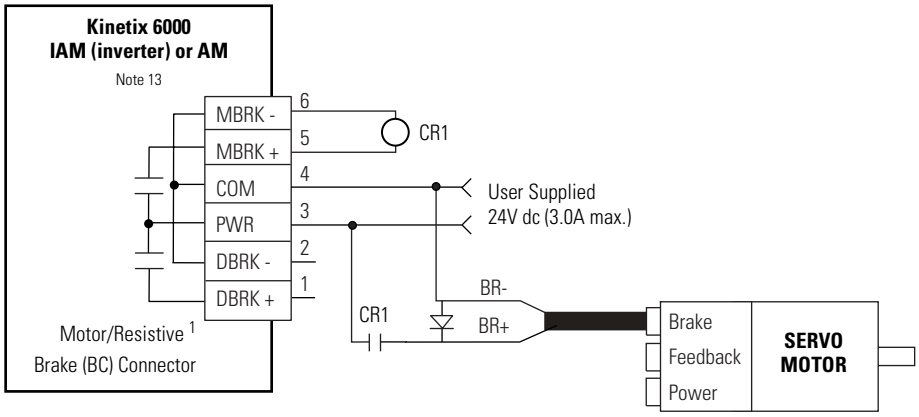
[1]Applies to 230V and 460V motors.

Coil Currents Rated >1.3A and ≤3.0A	
Compatible Brake Motors	**Coil Current**
H-8350 and -8500	2.20A

Coil Currents Rated >1.3A and ≤3.0A	
Compatible Brake Motors	**Coil Current**
MPL-B640, -B660, -B680, -B860, -B880, -B960, -B980	1.91 to 2.19A

Figure A.21 shows an example configuration using MBRK± and an external relay to control a motor brake which exceeds the drive (IAM/AM) internal relay rating.

Figure A.21
Example Configuration Controlling a Motor Brake



[1] For Motor/Resistive Brake (BC) connector specifications, refer to the *Kinetix 6000 Installation Manual* (publication 2094-IN001).

ATTENTION

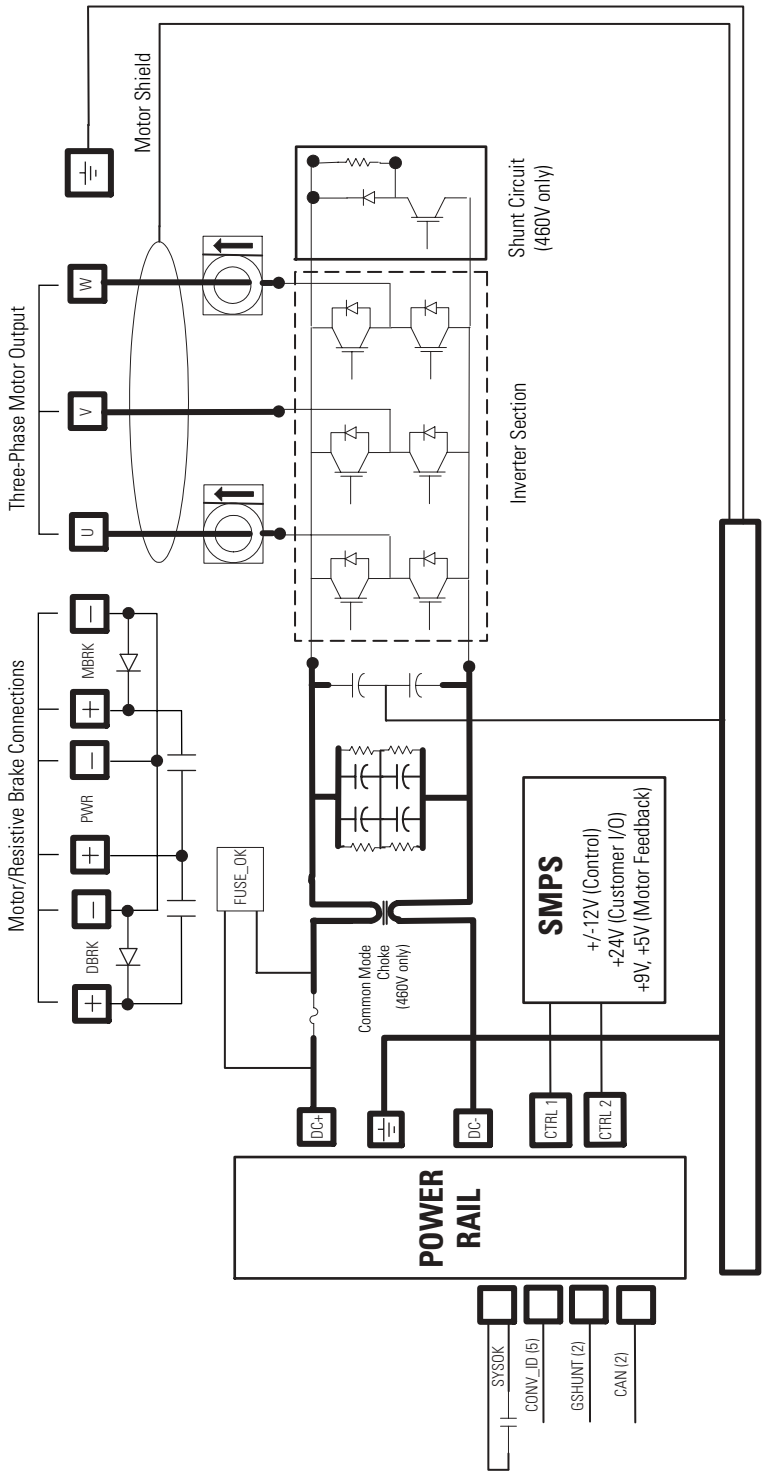
To avoid damage to the brake contactor, surge suppression (flyback diode or MOV, rated at appropriate voltage), must be used when controlling a brake coil.

System Block Diagrams

This section provides block diagrams of the Kinetix 6000 modules.

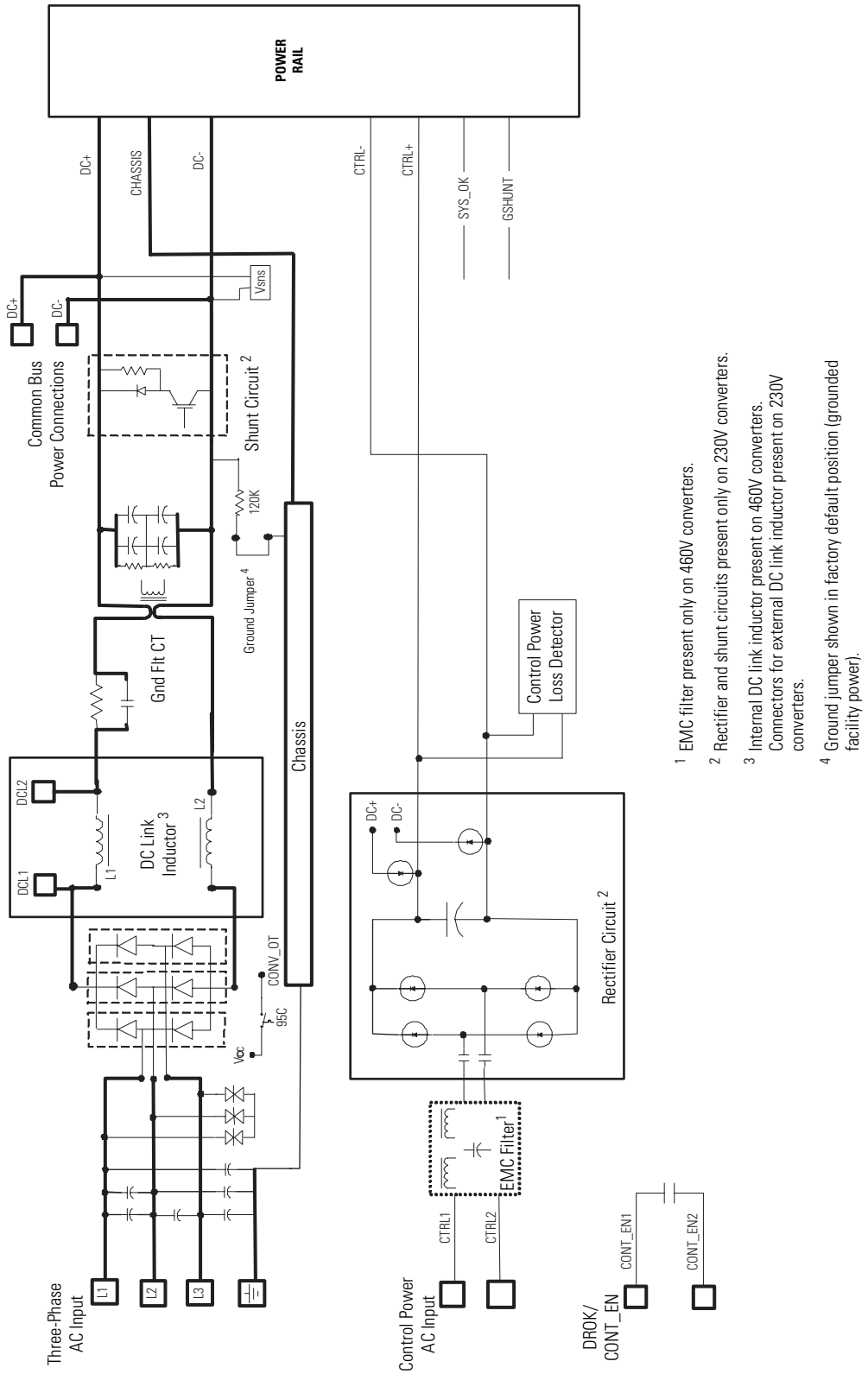
IAM/AM Inverter Block Diagram

Figure A.22
Inverter Block Diagram



IAM Converter Block Diagram

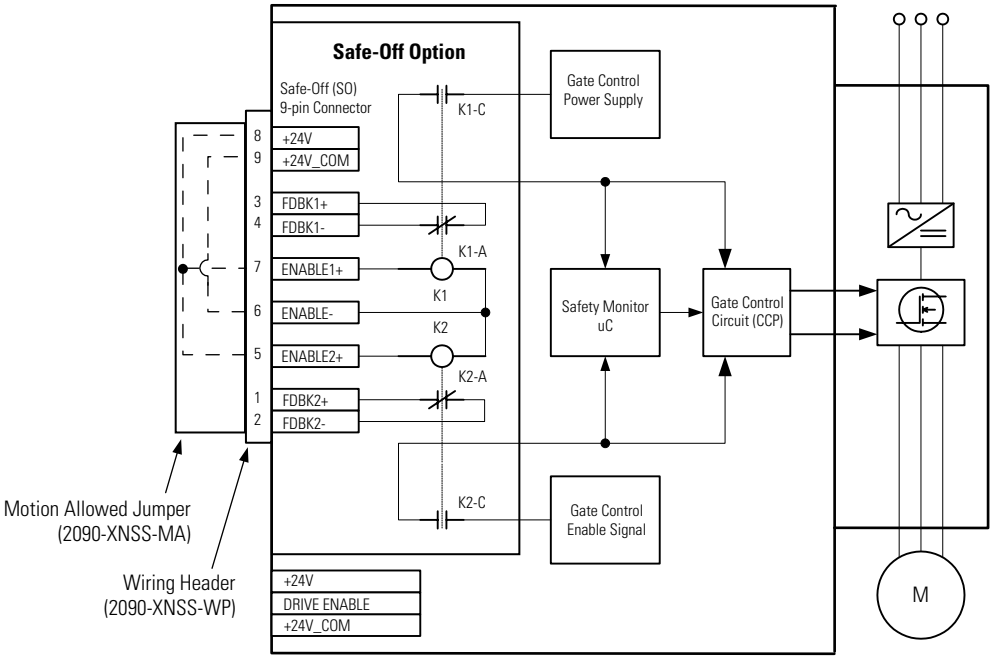
Figure A.23
Converter Block Diagram



Safe-Off Feature Block Diagram

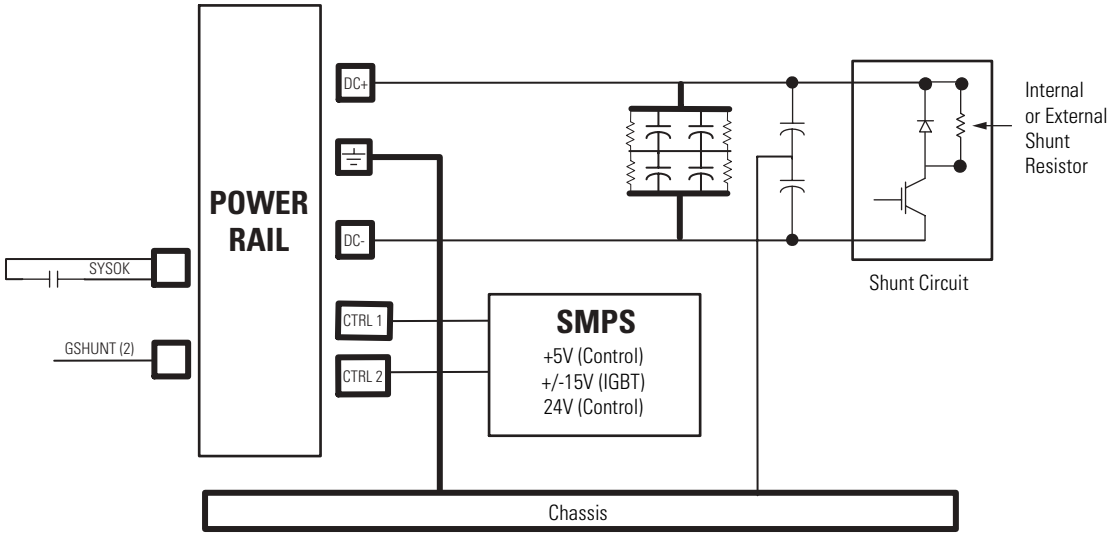
The Kinetix 6000 Safe-Off drives ship with the wiring header and motion allowed jumper installed, as shown in the figure below. With the motion allowed jumper installed, the safe-off feature is not used.

Figure A.24
Safe-Off Feature Block Diagram



SM Block Diagram

Figure A.25
Shunt Module Block Diagram



LIM Block Diagrams

Figure A.26
LIM Block Diagram (2094-AL75S)

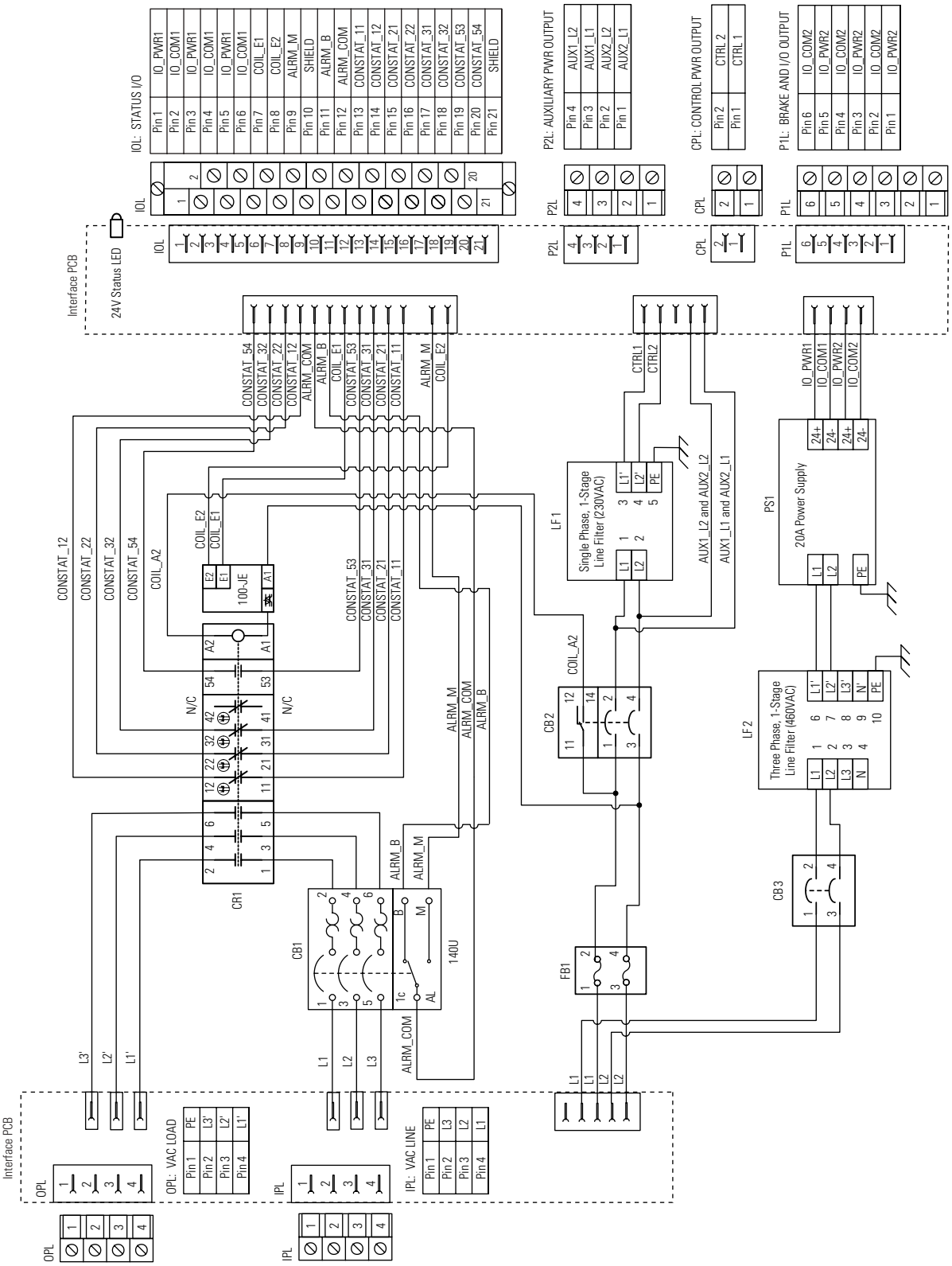


Figure A.27
LIM Block Diagram (2094-BL75S)

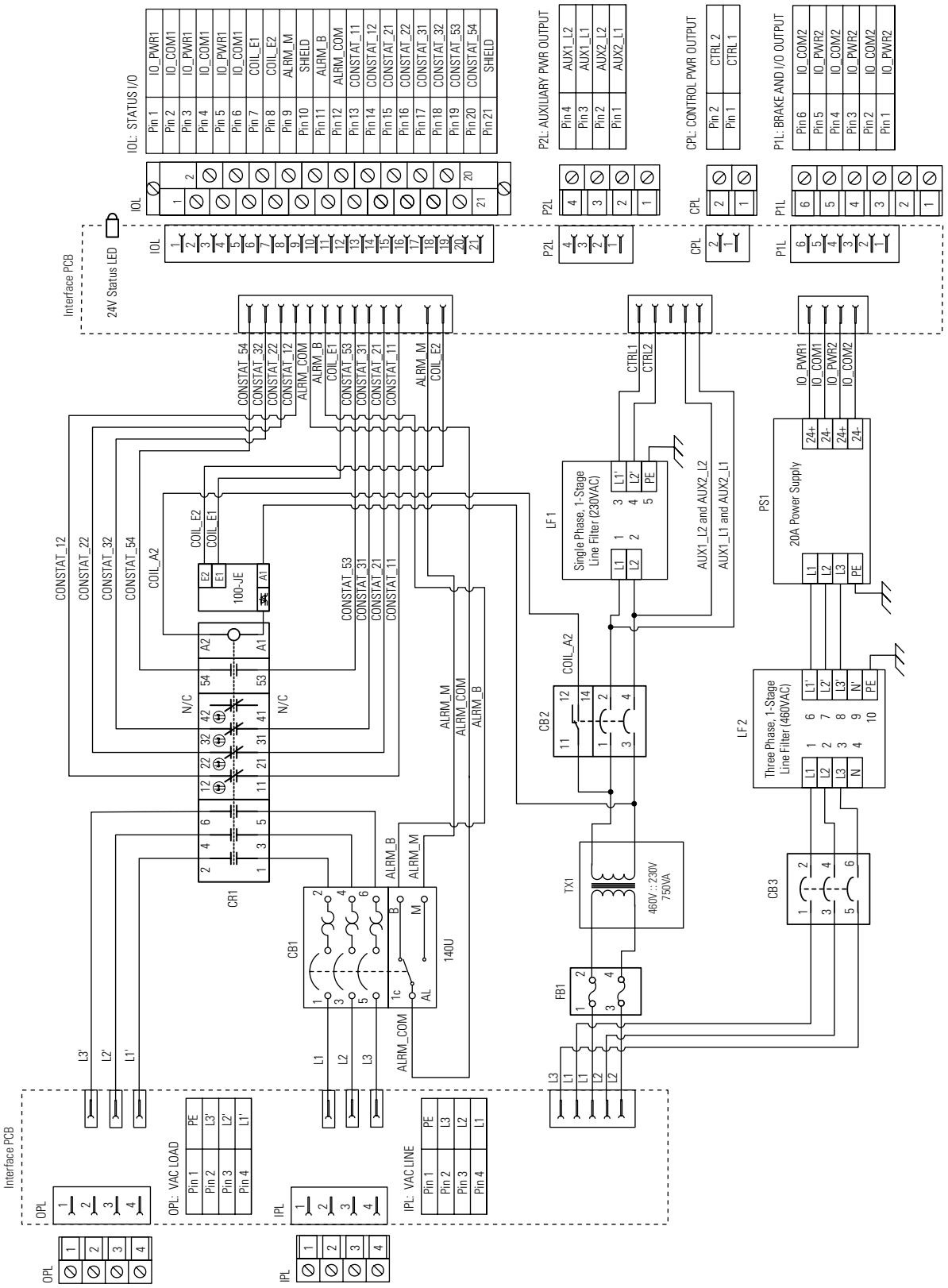


Figure A.28
LIM Block Diagram (2094-XL75S-C*x*)

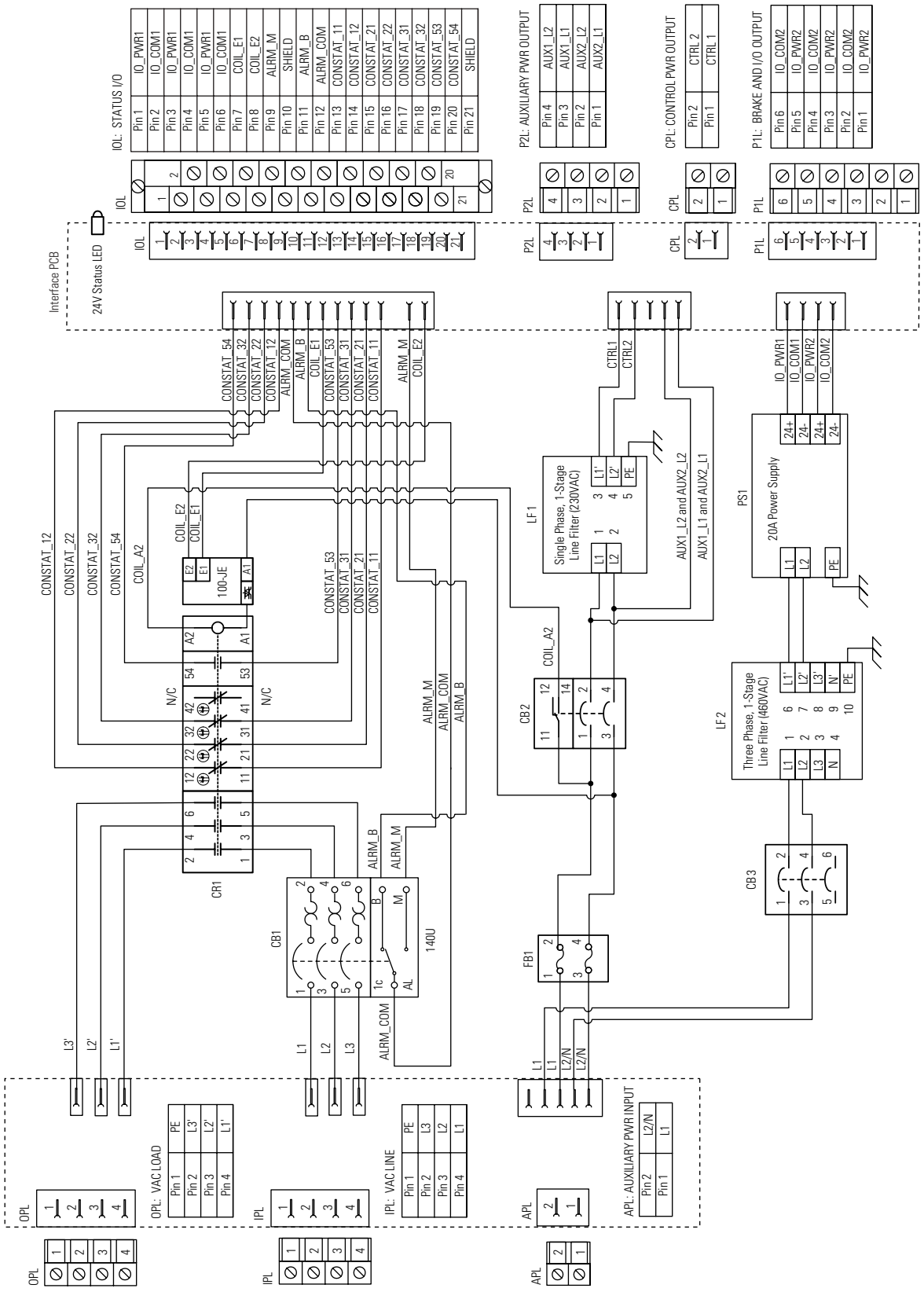


Figure A.29
LIM Block Diagram (2094-AL09)

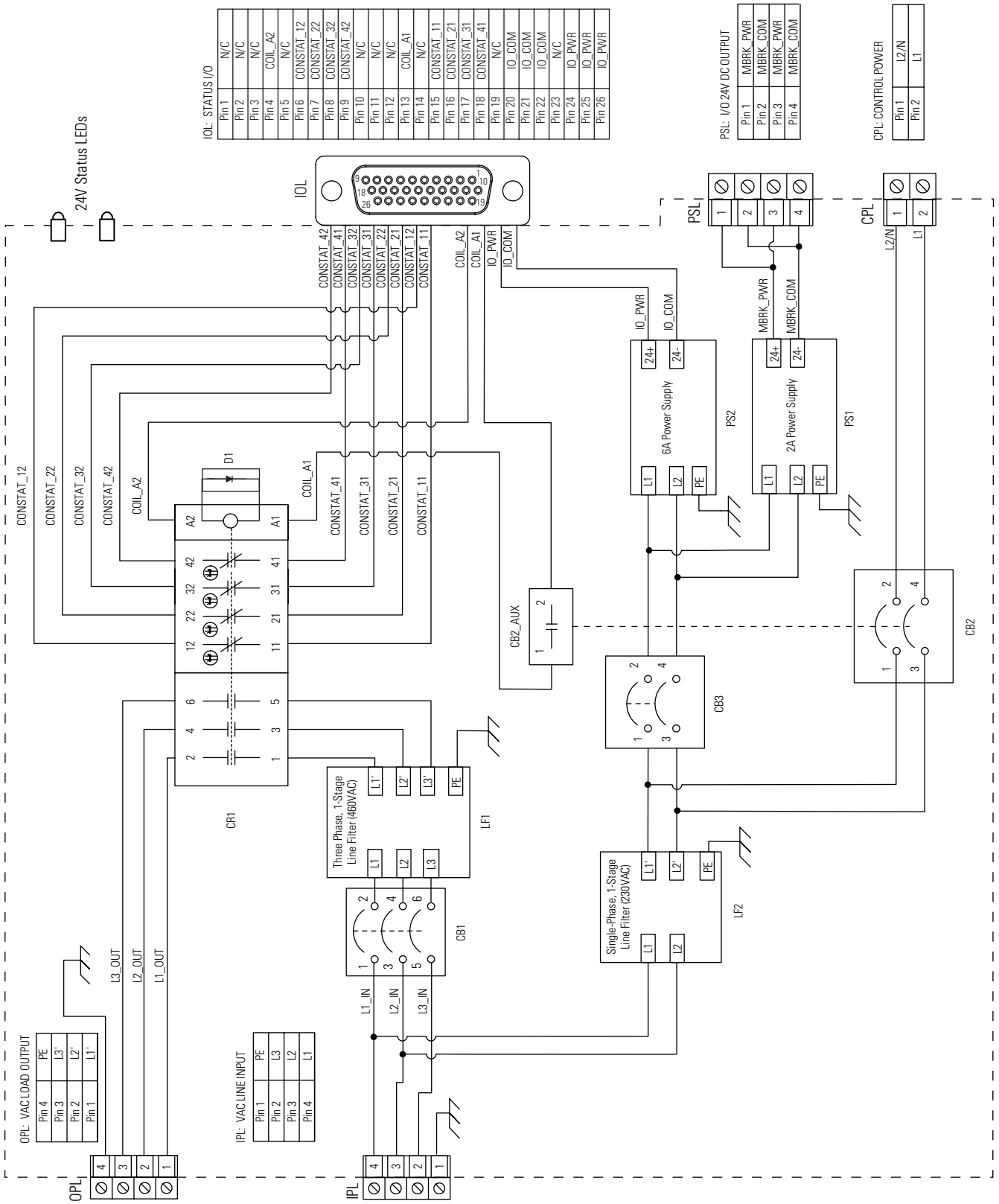
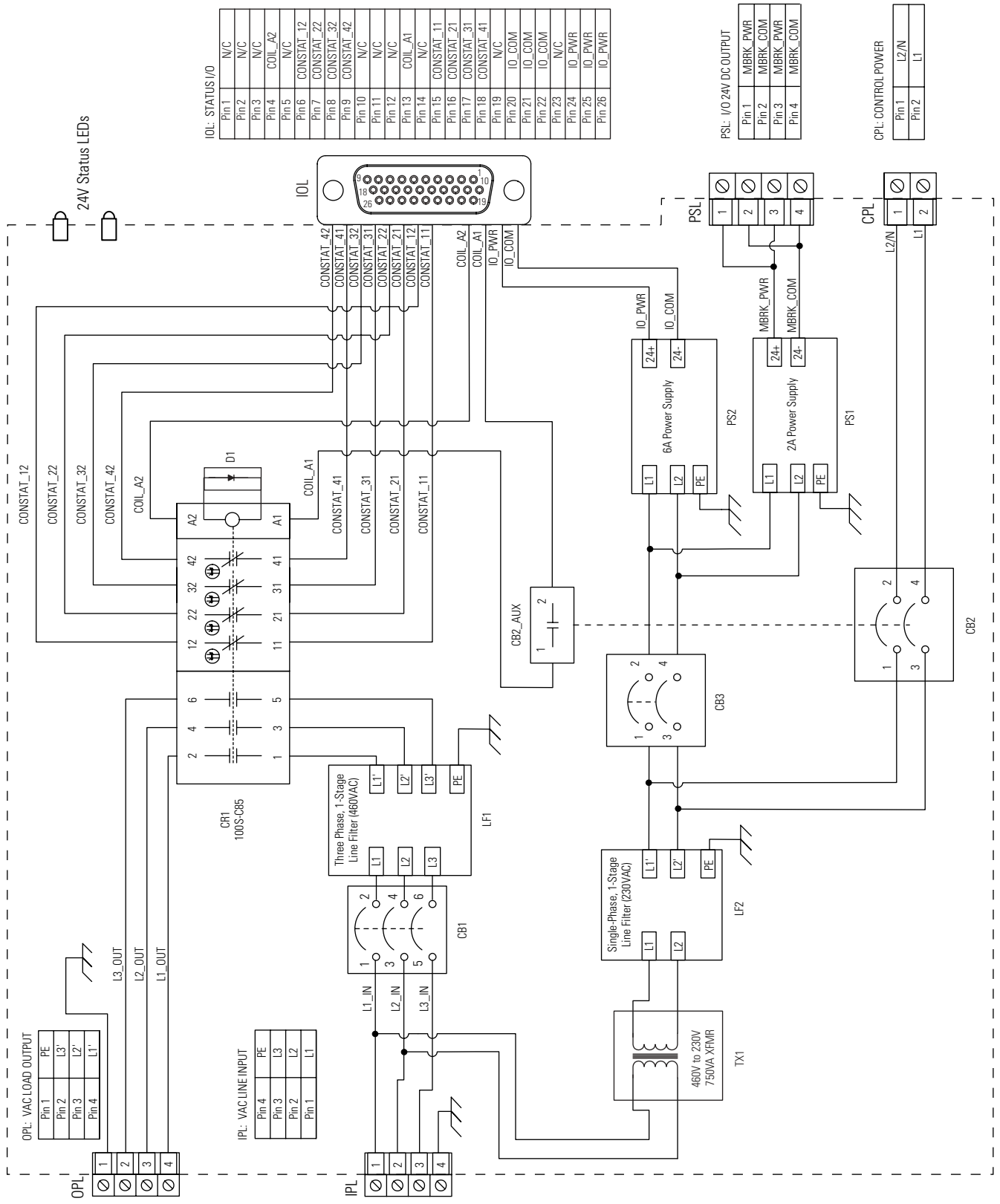


Figure A.30
LIM Block Diagram (2094-BL02)



RBM Block Diagrams

Figure A.31
RBM Block Diagram (2090-XB33-*xx*)

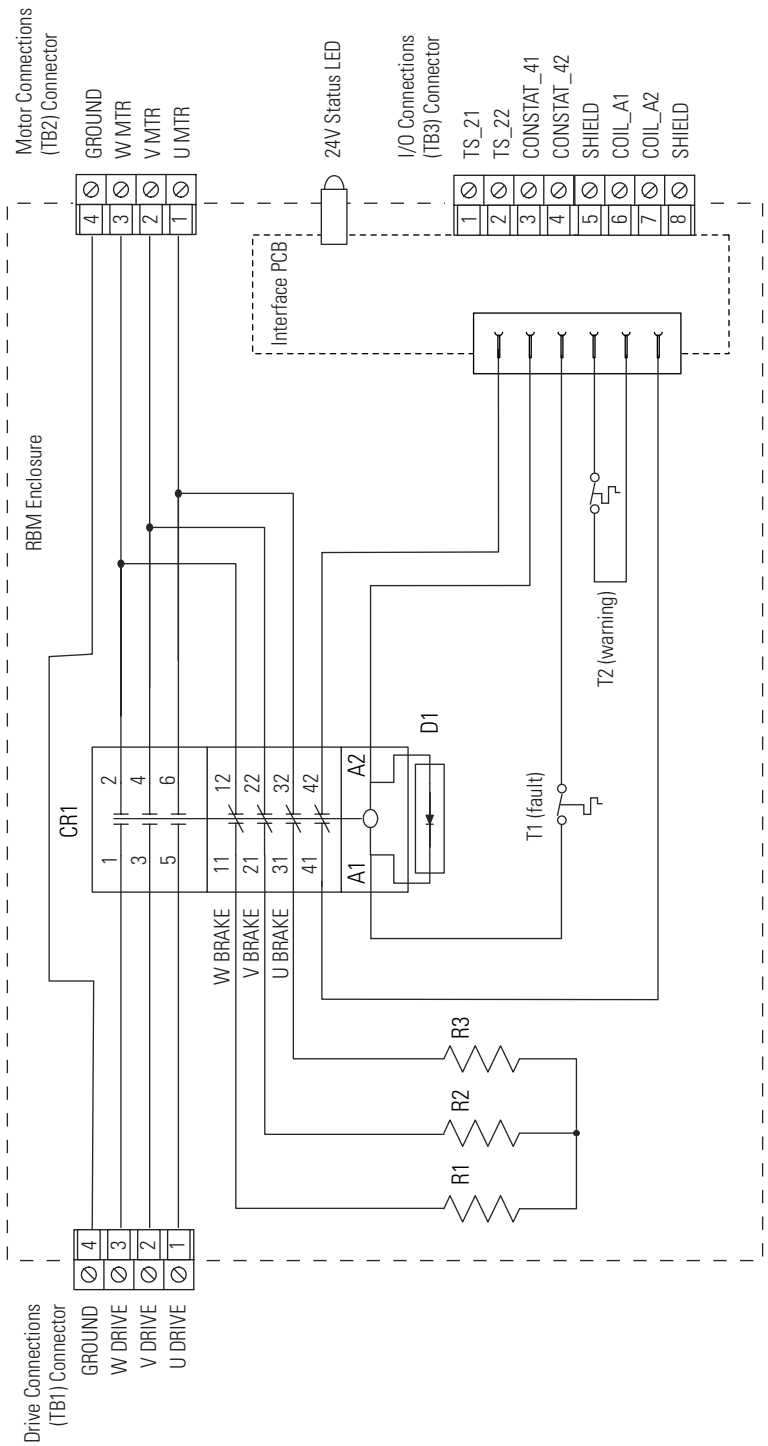
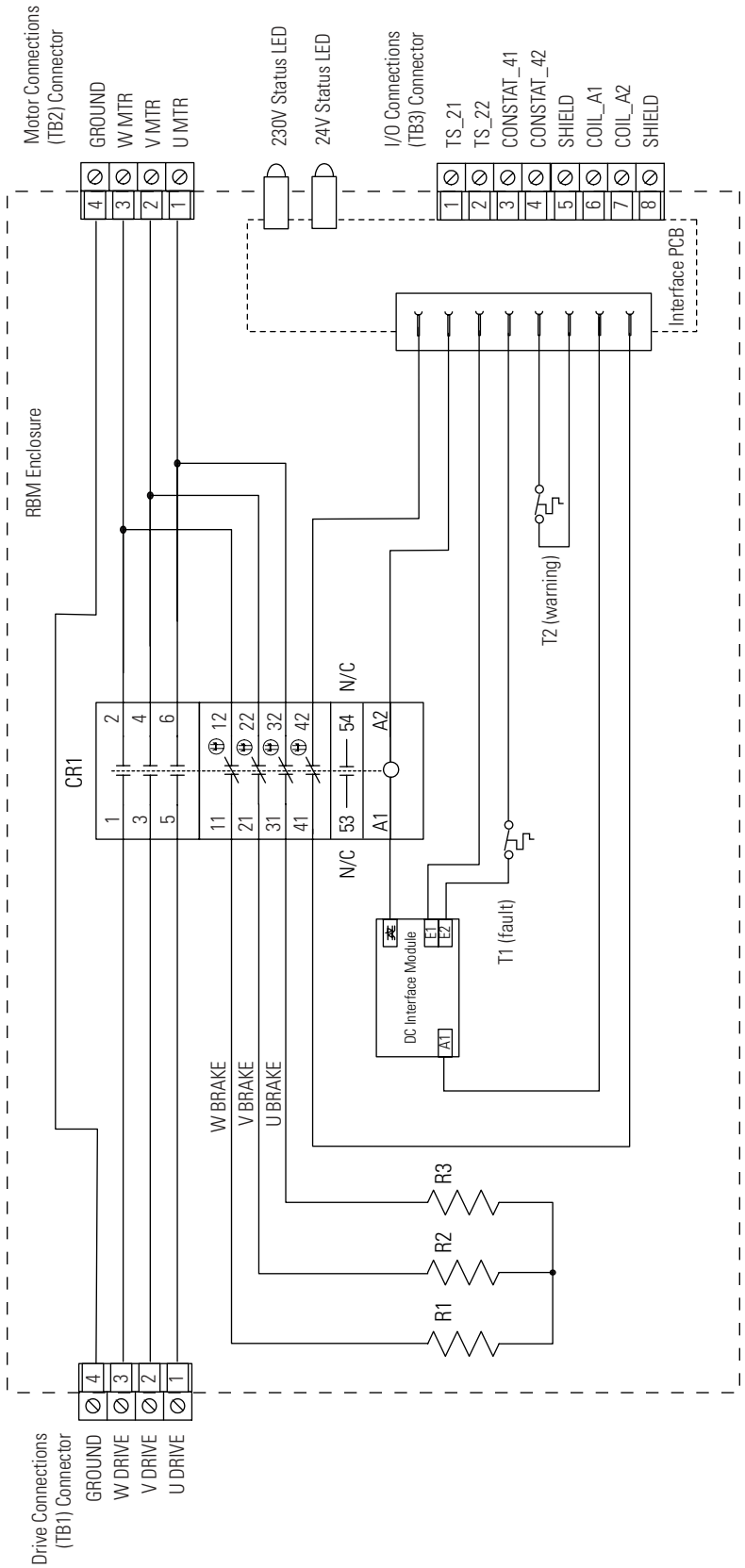


Figure A.32
RBM Block Diagram (2090-XB120-*xx*)



Upgrade Your Kinetix 6000 Firmware

Chapter Objectives

This appendix provides a procedure for upgrading the Kinetix 6000 firmware using DriveExplorer.

Upgrade Drive Firmware Using DriveExplorer

Upgrading axis module firmware using DriveExplorer (via the DPI port) involves setting the Axes to Flash parameter, configuring a HyperTerminal session, and flashing the firmware.

Before You Begin

Before you begin this procedure, make sure you have the following:

Description	Catalog Numbers	Minimum Firmware Revision
DriveExplorer Software [1]	9306-4EXP02ENE	2.01
Smart Self-Powered (DPI) Serial Converter	1203-SSS (Series B)	3.004
Firmware upgrade file for Kinetix 6000	N/A [2]	N/A [2]
Personal computer with HyperTerminal	N/A	N/A

[1] Refer to *DriveExplorer Getting Results Manual* (publication 9306-GR001) for instructions.

[2] Contact Rockwell Automation Technical Support at (440) 646-5800 for firmware upgrade file.

Select Axis Modules to Upgrade

In this procedure you will use DriveExplorer software to set the Axes to Flash parameter (*x*708) and allow selective axis module upgrading.

Note: You will save time by selecting only the axis module(s) that require a firmware upgrade.

To set the Axes to Flash parameter:

1. Apply 95-264V AC to the IAM control power (CPD) connector.

ATTENTION

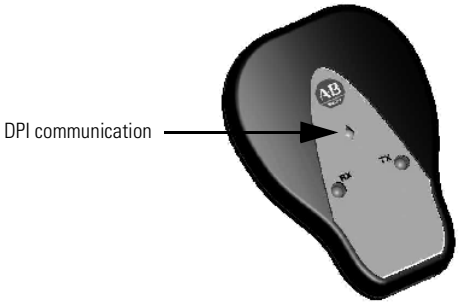
To avoid injury or damage to equipment due to unpredictable motor activity, do not apply AC input (three-phase) power or establish communications with the 1756-M*xx*SE SERCOS interface module.

2. Connect the 1203-SSS serial cable to the appropriate COM port on your personal computer.

3. Connect the 1203-SSS DPI cable to the DPI connector on your IAM.

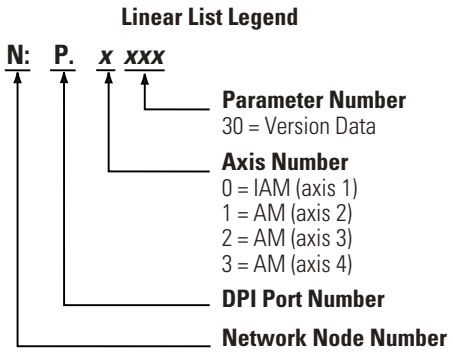
4. Verify that the 1203-SSS has power by observing the LED indicated in Figure B.1.

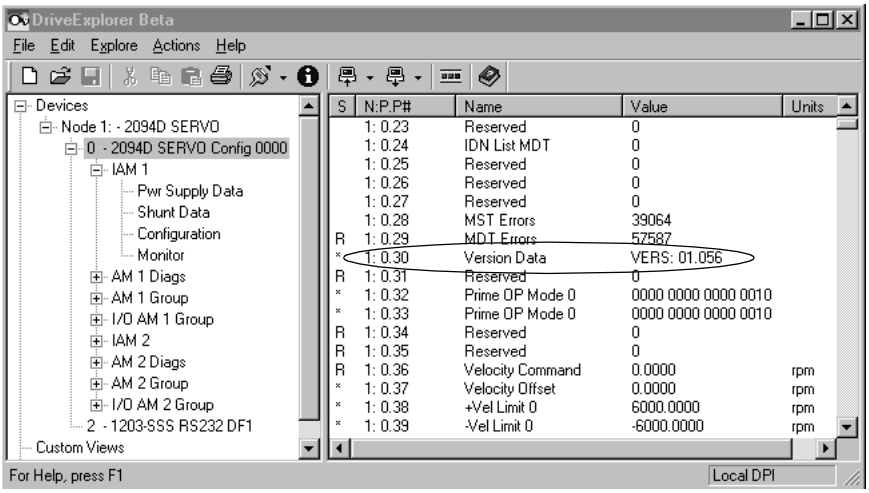
Figure B.1
1203-SSS DPI Adapter



5. Start the DriveExplorer software. Click on Explore\Connect. DriveExplorer proceeds to read your system.

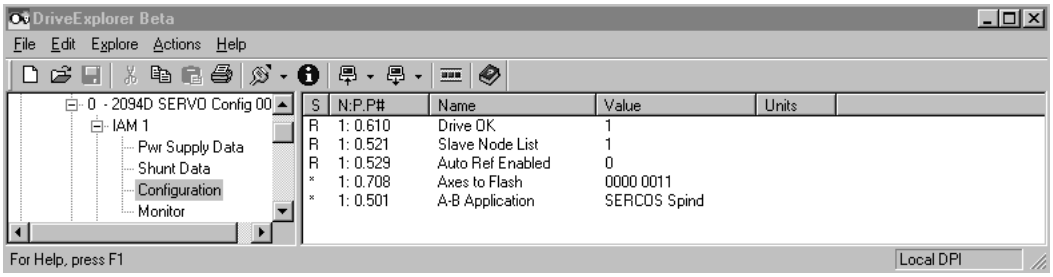
6. Double-click on **2094D SERVO Config 0000**. The linear list of parameters appears, as shown in the window below.



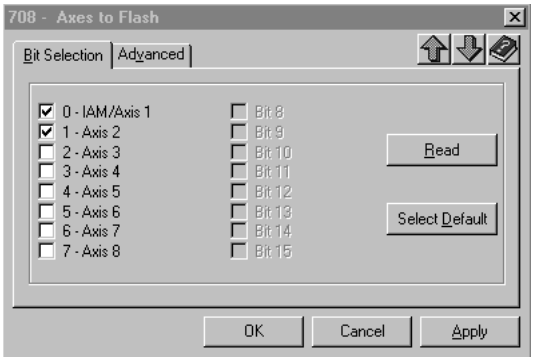


7. Scroll down to parameter *x:x.*30 (Version Data) and record the version (VERS: *xx.xxx*) of each axis module.

8. Double-click on **Configuration**. The following window opens.



9. Double-click on **Axes to Flash**. The Axis to Flash window opens.



10. Check each axis to flash (example above shows two axes to flash).

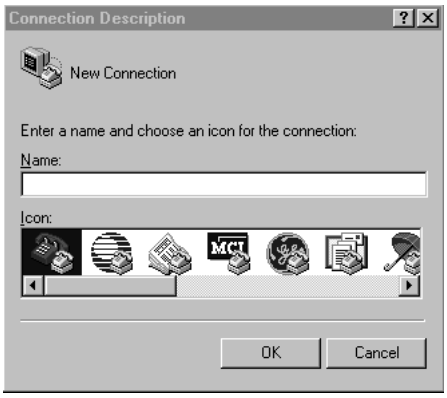
11. Select **OK**. The Axes to Flash parameter is set.

12. Close DriveExplorer.

HyperTerminal Configuration

To open and begin a new HyperTerminal session:

1. From the Windows Start menu, select Programs\Accessories\HyperTerminal\HyperTerminal. The New Connection window opens.



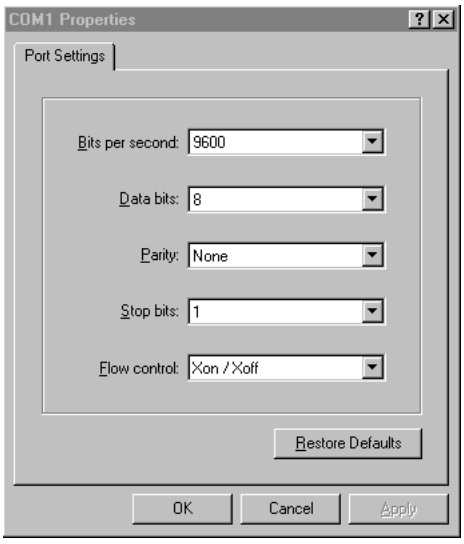
   - Name the new HyperTerminal file
   - Choose an icon for the connection

2. Select **OK**. The following window opens.

   Select the appropriate COM port

3. Select **OK**. The following window opens. Select the following properties as shown or as appropriate for your 1203-SSS DPI adapter.

IMPORTANT Bits per second of HyperTerminal must match the 1203-SSS DPI adapter setting for connection to occur.



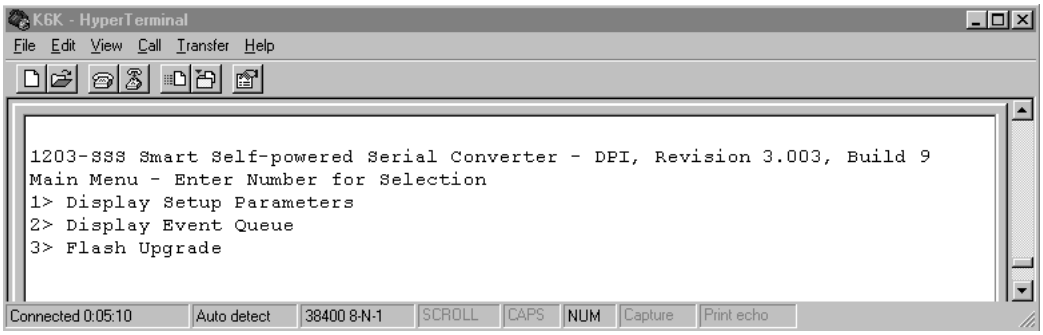
4. Select **OK**. HyperTerminal configuration is complete.

Flash Your Firmware

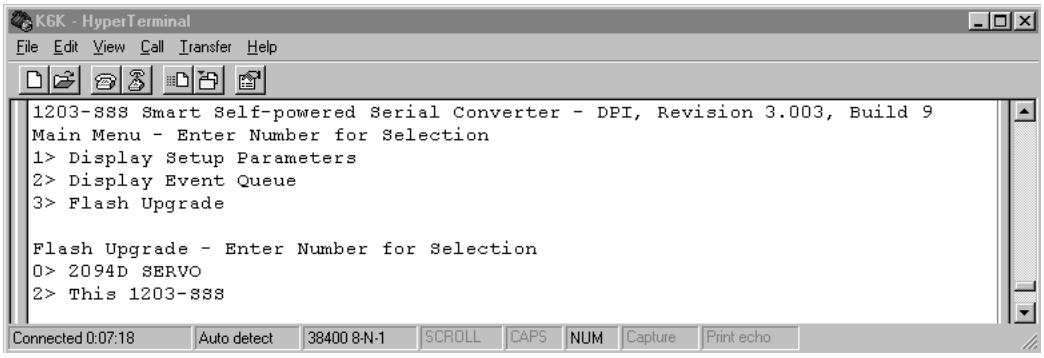
This procedure assumes you have identified which axis module(s) require flashing, have set the Axes to Flash parameter, and have configured a HyperTerminal session.

IMPORTANT You must also know where to find your firmware upgrade file.

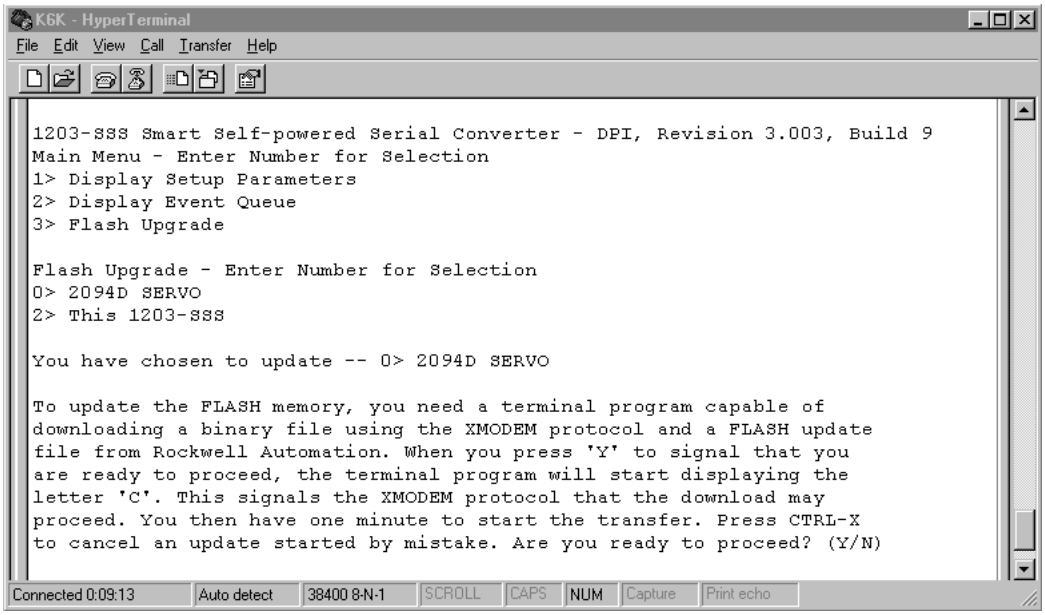
1. Press **ENTER**. The HyperTerminal main menu opens.



2. Enter **3**. The following window opens.



3. Enter **0**. The following window opens.

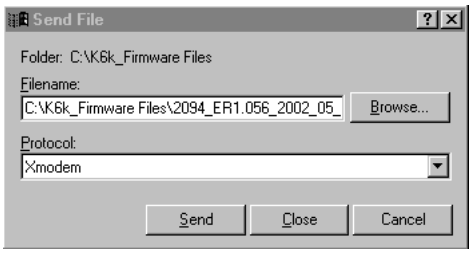


4. Enter **Y**. As indicated in the text, the program begins displaying the character C.

   Note: Program times-out after 60 seconds. If program times-out before you complete steps 5 - 7, return to step 1.

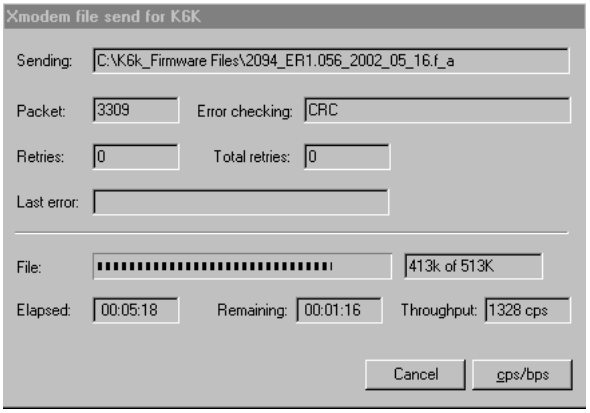
5. Go to the Transfer menu and select **Send File**. The Send File window opens. Browse for your firmware upgrade file.

Firmware upgrade file, as provided by Rockwell Automation Technical Support at (440) 646-5800.



6. Select **Xmodem** protocol.

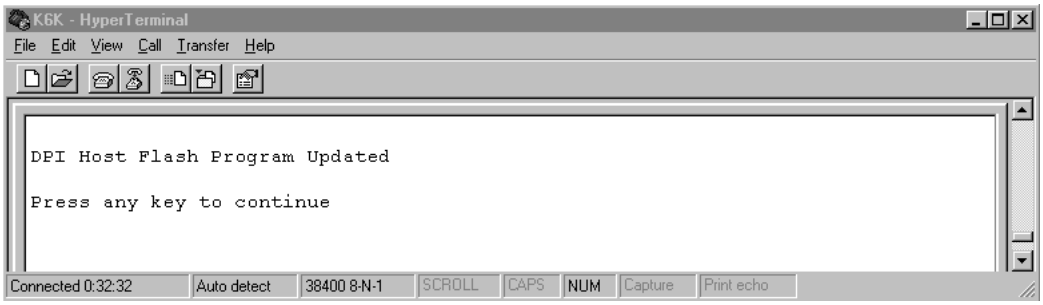
7. Select **Send**. The flash upgrade operation begins and the following window opens.



ATTENTION

To avoid unrecoverable fault to modules, do not interrupt control power to IAM, power to the 1203-SSS DPI adapter, or power to your PC while the flash upgrade operation is in progress.

8. The flash operation completes and the following window opens.



9. Close the HyperTerminal session.

10. Verify that parameter 30 for each axis module is now upgraded to the new firmware revision. Return to DriveExplorer (refer to *Select Axis Modules to Upgrade*, step 6) to see the linear list of parameters.

Integrate Resistive Brake Modules with Kinetix 6000 Drives

Chapter Objectives

This appendix provides Bulletin 2090 Resistive Brake Module (RBM) integration procedures specific to the Allen-Bradley Kinetix 6000 multi-axis servo drive systems using drive firmware v1.071 (or above). The procedure involves setting the time delay parameter using RSLogix 5000.

Before You Begin

These procedures assume you have mounted and wired your RBM with your Kinetix 6000 drive system. The following publications are available to assist you with RBM installation:

Title	Publication Number
Kinetix 6000 Installation Manual	2094-IN001
Resistive Brake Module Installation Instructions	2090-IN009

Understand Safety Precautions

The following precautions apply to resistive brake module installation as shown in the interconnect diagrams. Be sure to read and thoroughly understand them before proceeding.

ATTENTION

The interconnection diagrams should be used as a general recommendation on how the safety control circuit may be implemented. Actual applications may vary due to requirements based on the machine builders risk assessment. The machine builder must perform a risk assessment and determine a category level of safety that must be applied to the machine.

Safety Standards for Reference

- EN 1050 Safety of Machinery - Principles for Risk Assessment
- EN 60204-1 Safety of Machinery - Electrical Equipment of Machines
- EN 292-1/2 Safety of Machinery - Basic Concepts, General Principles for Design
- EN 954-1 Safety of Machinery - Safety Related Parts of Control Systems
- NFPA 79 Electrical Standard for Industrial Machinery
- ANSI B11.TR3 Risk Assessment and Risk Reduction. A guide to estimate, evaluate, and reduce risks associated with machine tools.

Background on Safety Design

There are numerous safety standards regarding machine design including OSHA, NFPA, AMT, CENELEC and ISO. In Europe, CENELEC and ISO coordinate the development of standards to which products can satisfy the laws of the Machinery Directive. In the United States, Standard Development Organizations (SDO) like the NFPA and AMT sponsor the development of standards to help companies meet OSHA requirements.

Stop Categories

One of the most basic safety functions is stopping the machine. The stopping function of a machine must fall into one of three categories (EN60204-1 and NFPA79). The categories are as follows:

- **Stop Category 0**: Stopping by immediate removal of power to the machine actuators.
- **Stop Category 1**: A controlled stop with power to the machine actuators to achieve the stop and then removal of power when the stop is achieved.
- **Stop Category 2**: A controlled stop with power left available to the machine actuators.

E-Stops are a special case of stops, and have additional requirements to those stated above. This appendix is intended to show how a light curtain or gate interlock might interface with one axis of motion control to achieve a machine stop and this stop may not be the same as the E-stop function of a machine.

Risk Assessment

The European safety standard (EN 1050) and U.S. technical report (ANSI B11.TR3) explain the process of risk assessment, which must be conducted by the machine builder. This is done by analyzing the tasks that people perform on and around the machine. This includes functions such as operation, set up, and maintenance. For the purpose of this appendix, the light curtain or gate interlock is intended to focus on the operation and perhaps loading/unloading of a machine. Additional protective measures must be identified by the risk assessment.

Machinery Directive EN 954-1 Safety Related Parts of Control Systems defines how to determine the safety requirements by categorizing the risk. This standard outlines the design of fail-safe control circuits by categorizing five levels of risk. It is deemed the machine designers responsibility to objectively identify a risk level for a particular machine and design all safety related systems to that level. The five categories are as follows:

Category B: Safety devices and control systems, as a minimum, must be designed, selected, and assembled to meet the operational requirements of design limits and influence of the processed materials and other external influences listed as: effects of vibration, loss of power supply, and external fields.

Category 1: All conditions of Category B apply, but the safety related part of the control system must use well tried principles and components (refer to 7.2.2: prEN951-1). The use of single electronic components, electronic logic or software is not considered adequate, even at this level.

Category 2: All conditions of Category B apply, but in addition, the machine shall be prevented from starting if a fault is detected upon power up. This suggests the use of an interface relay with redundancy and self-checking on energization. Single channel operation is permitted providing that the input devices (E-Stop buttons, gate switches, etc.) are tested for operation on a regular basis. If regular testing cannot be guaranteed, then the designer has little choice but to opt for two channel control.

Category 3: All conditions of Category B apply, but the complete safety control system shall be designed so that any single fault shall not lead to the loss of the safety function and, where practical, the single fault shall be detected. This now calls for not only redundancy in the interface relay but also in the input devices pointing to dual channel systems.

Category 4: All the conditions of Category B apply and, in addition, any single fault must be detected at or before the next call on the safety system, or an accumulation of three faults shall not lead to the loss of the safety function.

Control Reliability

In the United States the AMT has promoted a concept called Control Reliability as part of the ANSI B11.TR3 standard. This standard has similar requirements to those in the Machinery Directive EN954-1 Category 3 risk standard.

Control Reliability is defined as the ability of a safety system to go into a safe state in the event of a failure. In other words, the safety system must bring the machine to a safe state in the event of a single fault.

Resistive Brake Module Interconnect Diagram Notes

This section provides interconnect diagrams to assist you in wiring a Kinetix 6000 system which includes an RBM. The notes in the table below apply to the following example RBM interconnect diagrams.

ATTENTION

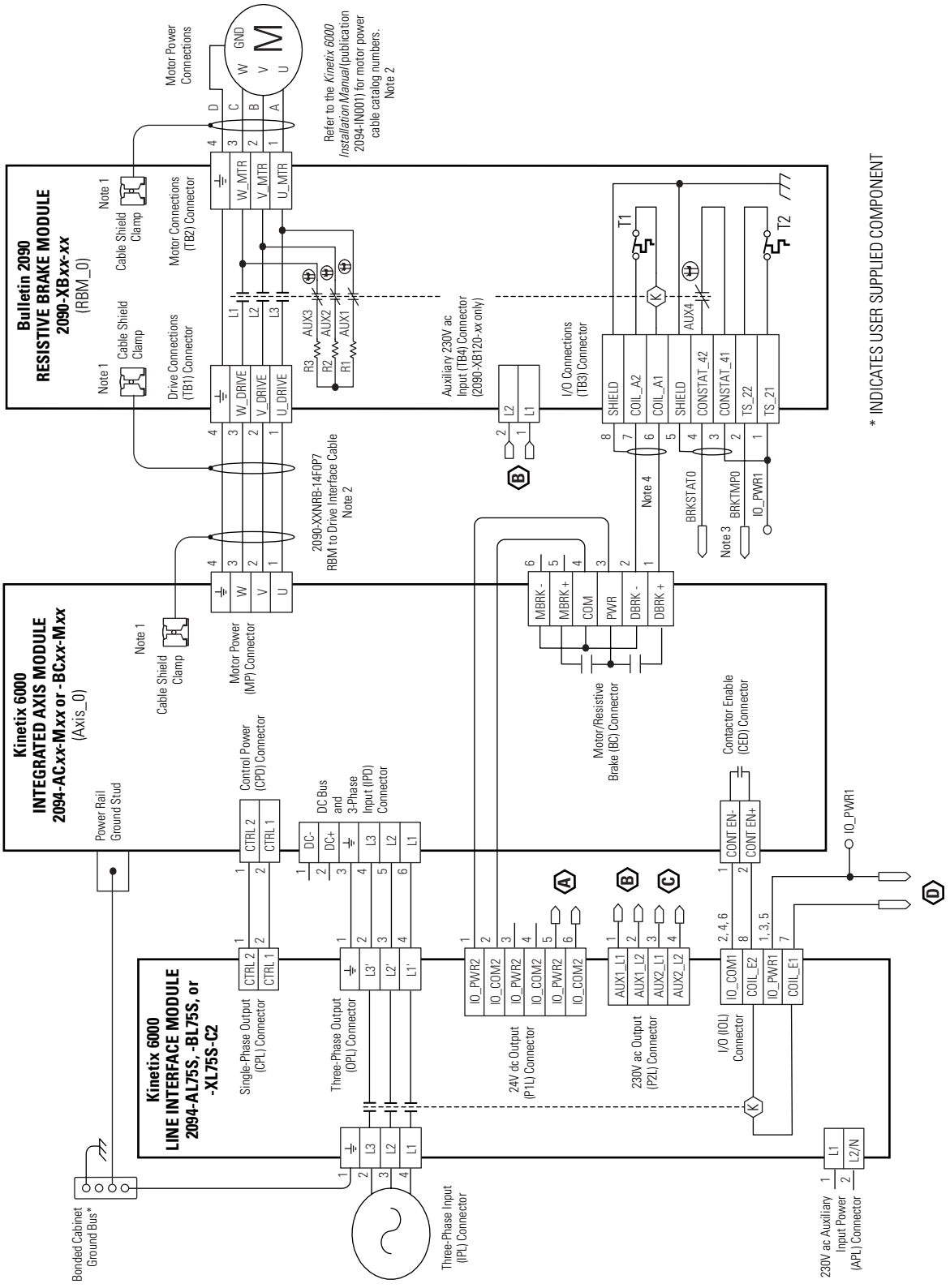
The National Electrical Code and local electrical codes take precedence over the values and methods provided. Implementation of these codes is the responsibility of the machine builder.

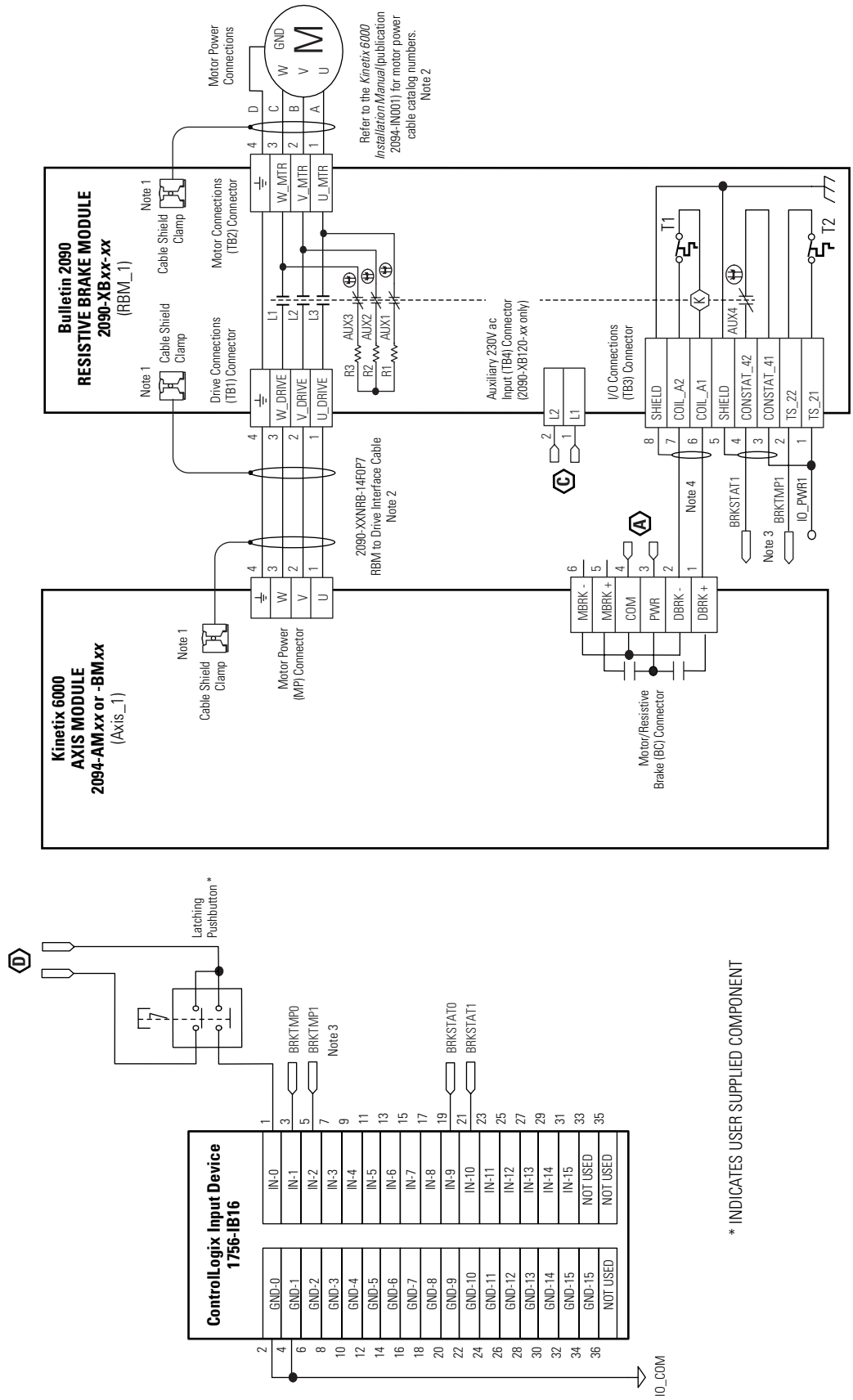
Note	Information
1	Cable shield clamp must be used in order to meet CE requirements. No external connection to ground required.
2	For motor cable specifications, refer to the *Kinetix Motion Control Selection Guide* (publication GMC-SG001).
3	The BRKTMP0 signal can be wired to a ControlLogix input as overtemp warning in user program.
4	Firmware version 1.071 (or higher) is required to use the DBRK outputs on the Kinetix 6000 IAM or AM.
5	The safety relay time delay should be set beyond the time required to stop and disable the axis when running at full speed.
6	Drive Enable Input Checking must be selected in Axis Properties.

Resistive Brake Module Interconnect Diagrams

The example diagram below shows Kinetix 6000 IAM, AM, and LIM (2094-AL75S, -BL75S, and -XL75S) wired with the Bulletin 2090 RBM.

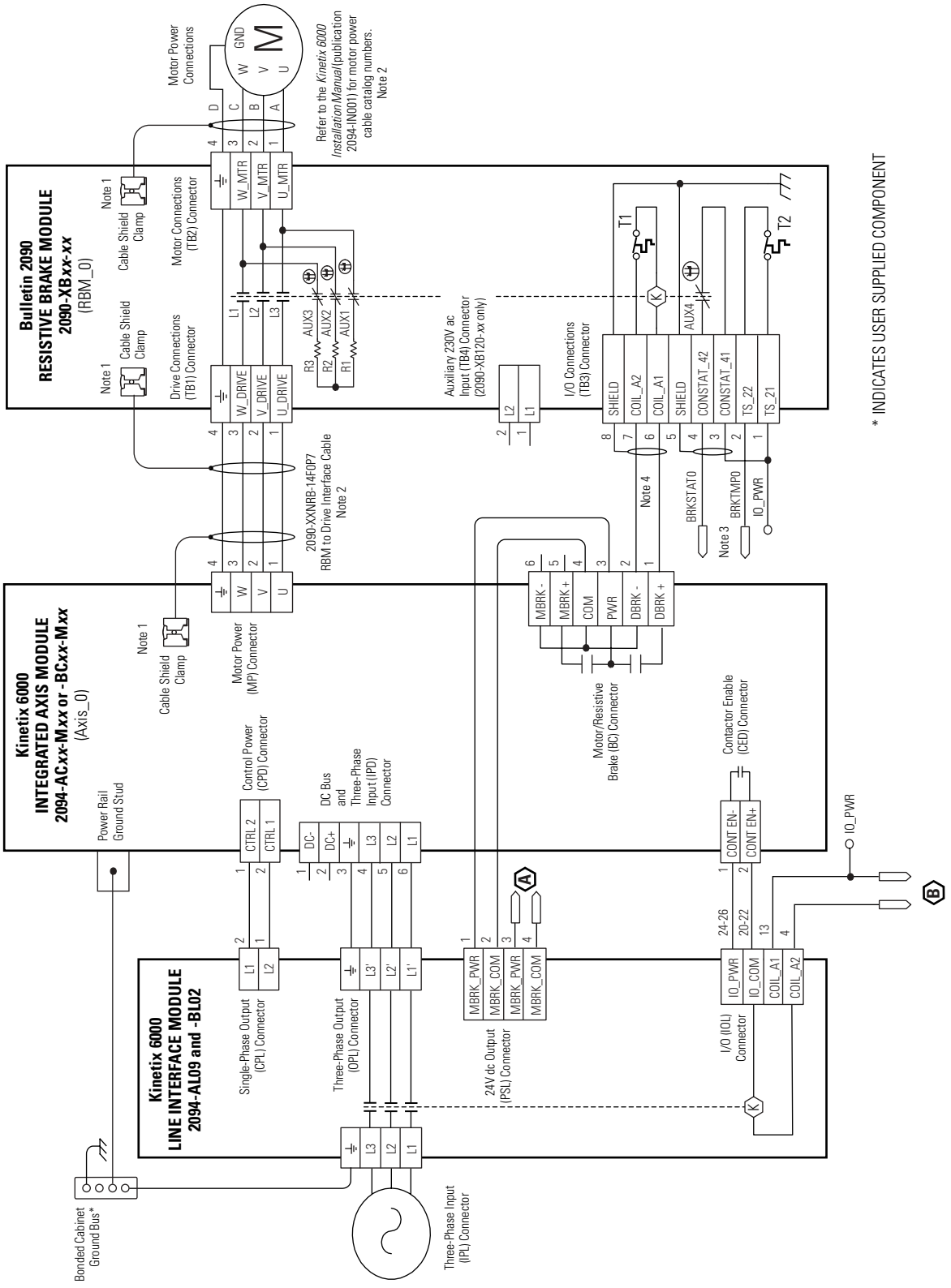
Figure C.1
Example RBM Interconnection Diagram (Category 2 Configuration per EN954-1)

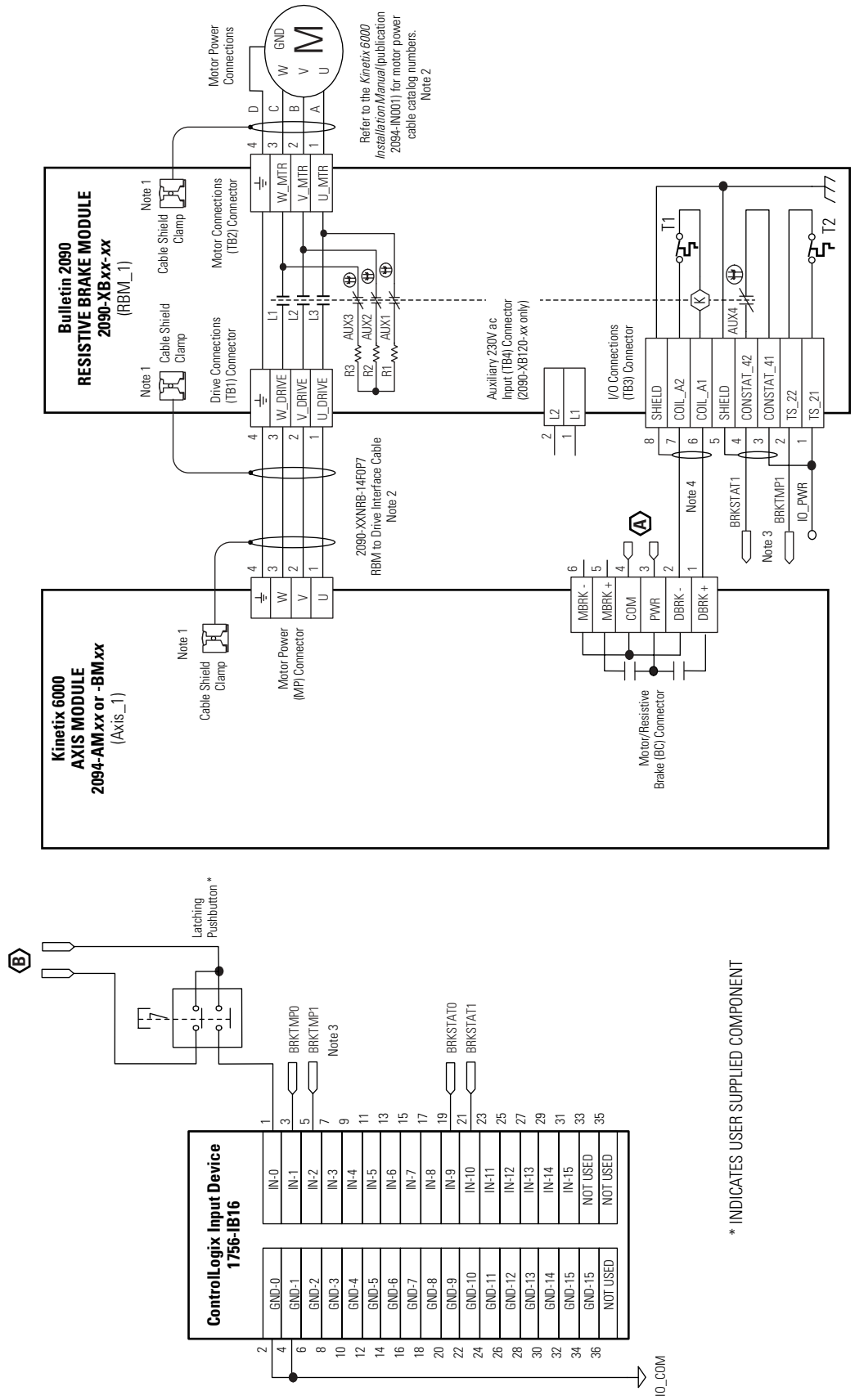



Bulletin 2090
RESISTIVE BRAKE MODULE
2090-XBxx-xx
(RBM_1)
Kinetix 6000
AXIS MODULE
2094-AMxx or -BMxx
(Axis_1)
Motor Power Connections
Refer to the Kinetix 6000 Installation Manual (publication 2094-IN001) for motor power cable catalog numbers.
Note 2
Motor Connections (TB2) Connector
Drive Connections (TB1) Connector
Auxiliary 230V ac Input (TB4) Connector (2090-XB120-xx only)
I/O Connections (TB3) Connector
Cable Shield Clamp
Note 1
2090-XXNRB-14F0P7
RBM to Drive Interface Cable
Note 2
Motor Power (MP) Connector
Motor/Resistive Brake (BC) Connector
Note 4
Note 3
BRKSTAT1
BRKTMP1
IO_PWR1
Latching Pushbutton *
ControlLogix Input Device
1756-IB16
BRKTMP0
BRKSTAT0
IO_COM
* INDICATES USER SUPPLIED COMPONENT

The example diagram below shows Kinetix 6000 IAM, AM, and LIM (2094-AL09 and -BL02) wired with the Bulletin 2090 RBM.

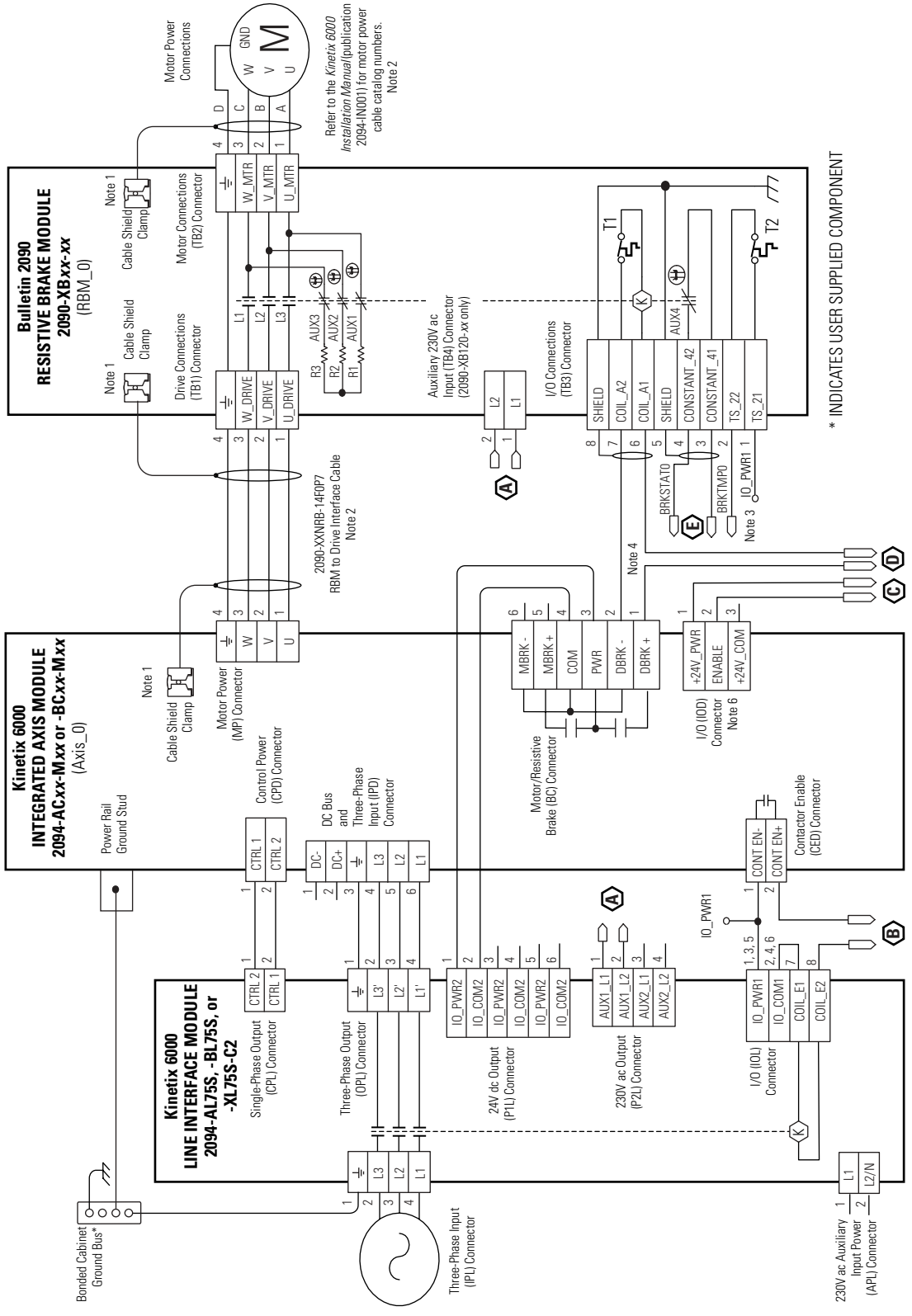
Figure C.2
Example RBM Interconnection Diagram (Category 2 Configuration per EN954-1)

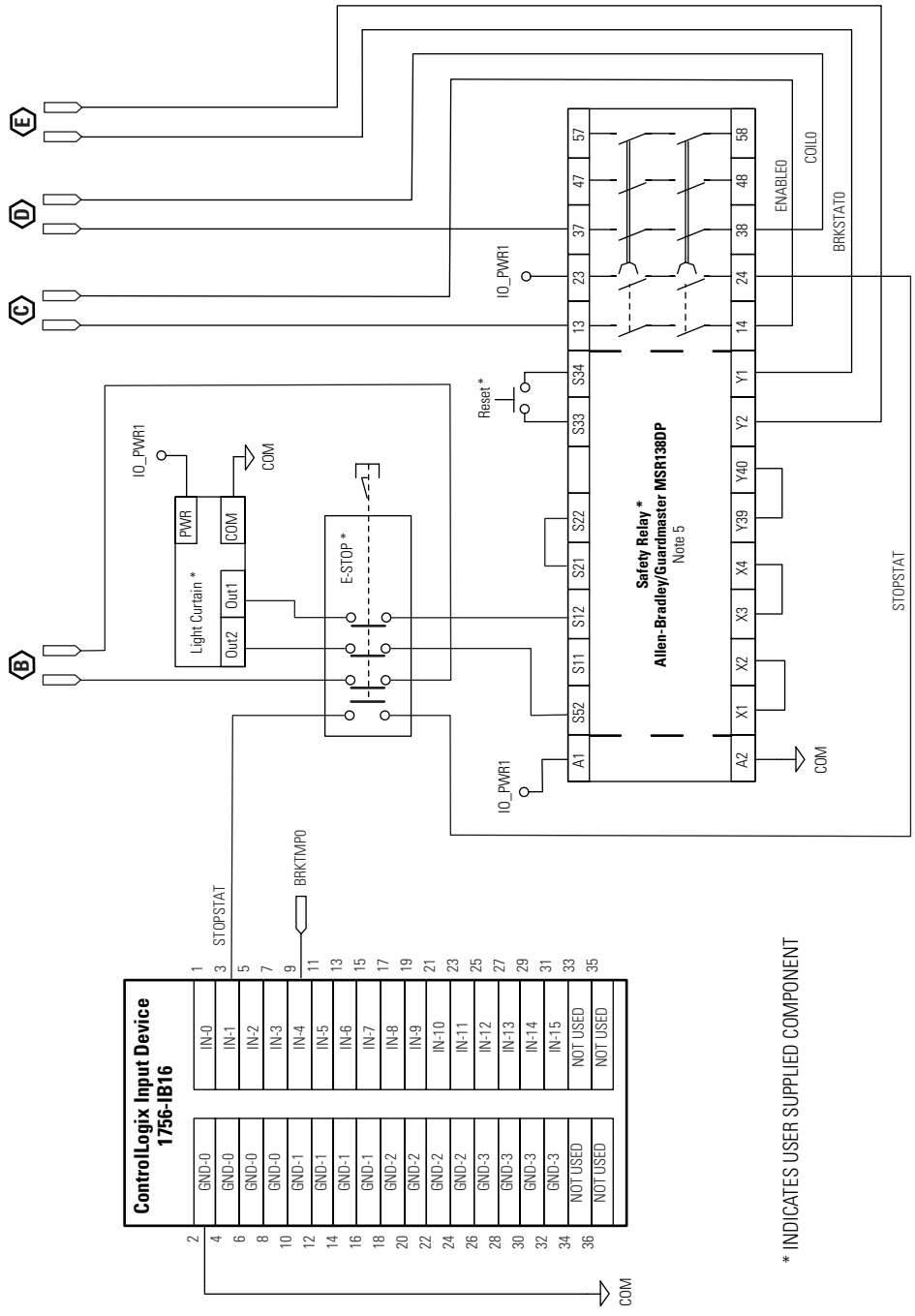



Bulletin 2090
RESISTIVE BRAKE MODULE
2090-XBxx-xx
(RBM_1)
Kinetix 6000
AXIS MODULE
2094-AMxx or -BMxx
(Axis_1)
Motor Power Connections
Refer to the Kinetix 6000 Installation Manual (publication 2094-IN001) for motor power cable catalog numbers.
Note 2
Motor Connections (TB2) Connector
Drive Connections (TB1) Connector
Cable Shield Clamp
Note 1
2090-XXNRB-14F0P7
RBM to Drive Interface Cable
Note 2
Auxiliary 230V ac Input (TB4) Connector (2090-XB120-xx only)
I/O Connections (TB3) Connector
Motor Power (MP) Connector
Motor/Resistive Brake (BC) Connector
Note 4
Note 3
BRKTMP1
IO_PWR
BRKSTAT1
Latching Pushbutton *
ControlLogix Input Device
1756-IB16
BRKTMP0
BRKSTAT0
IO_COM
* INDICATES USER SUPPLIED COMPONENT

The example diagram below shows Kinetix 6000 IAM and LIM (2094-AL75S, -BL75S, and -XL75S) wired with the Bulletin 2090 RBM.

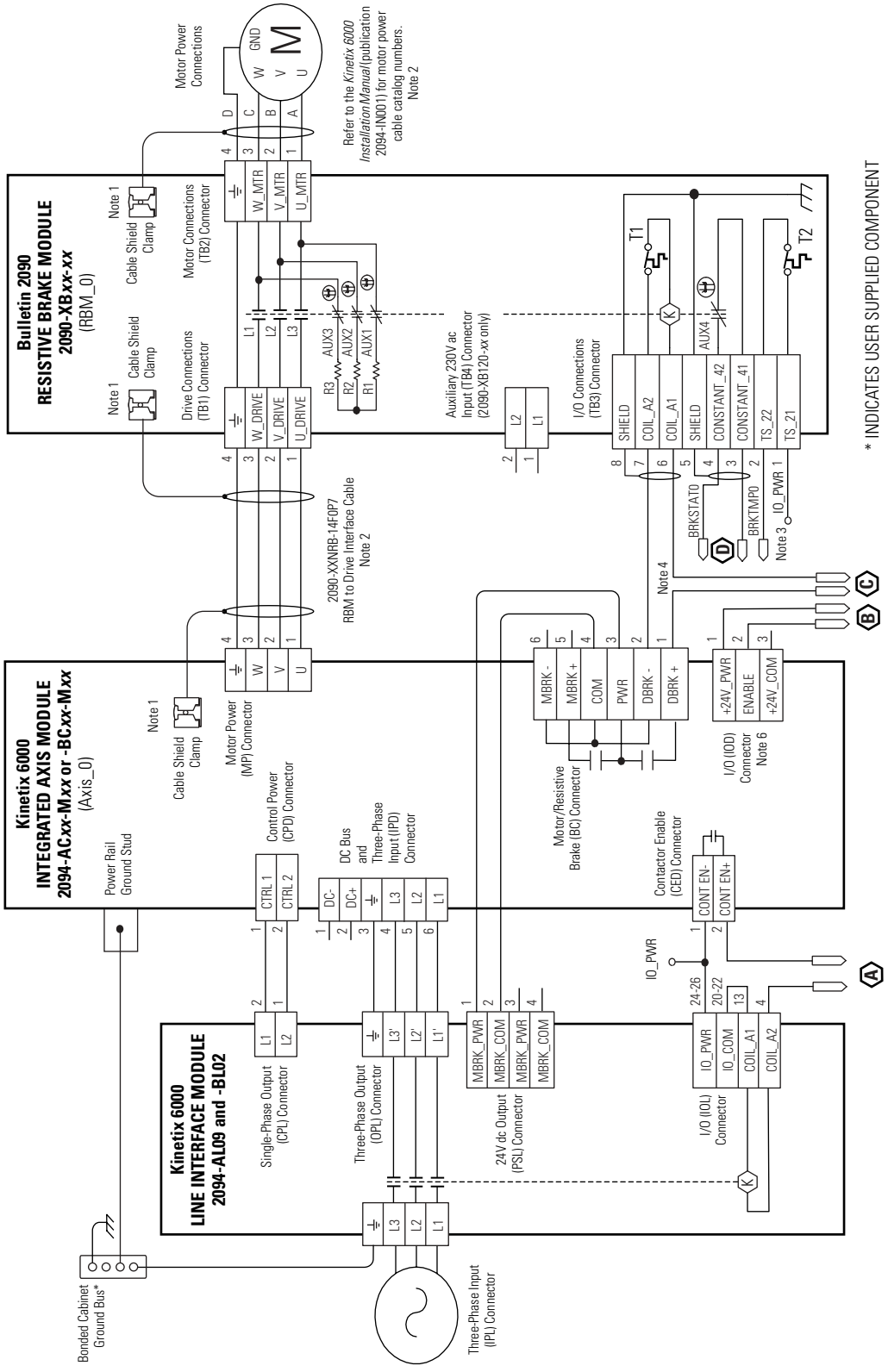
Figure C.3
Example RBM Interconnection Diagram (Category 3 Configuration per EN954-1)

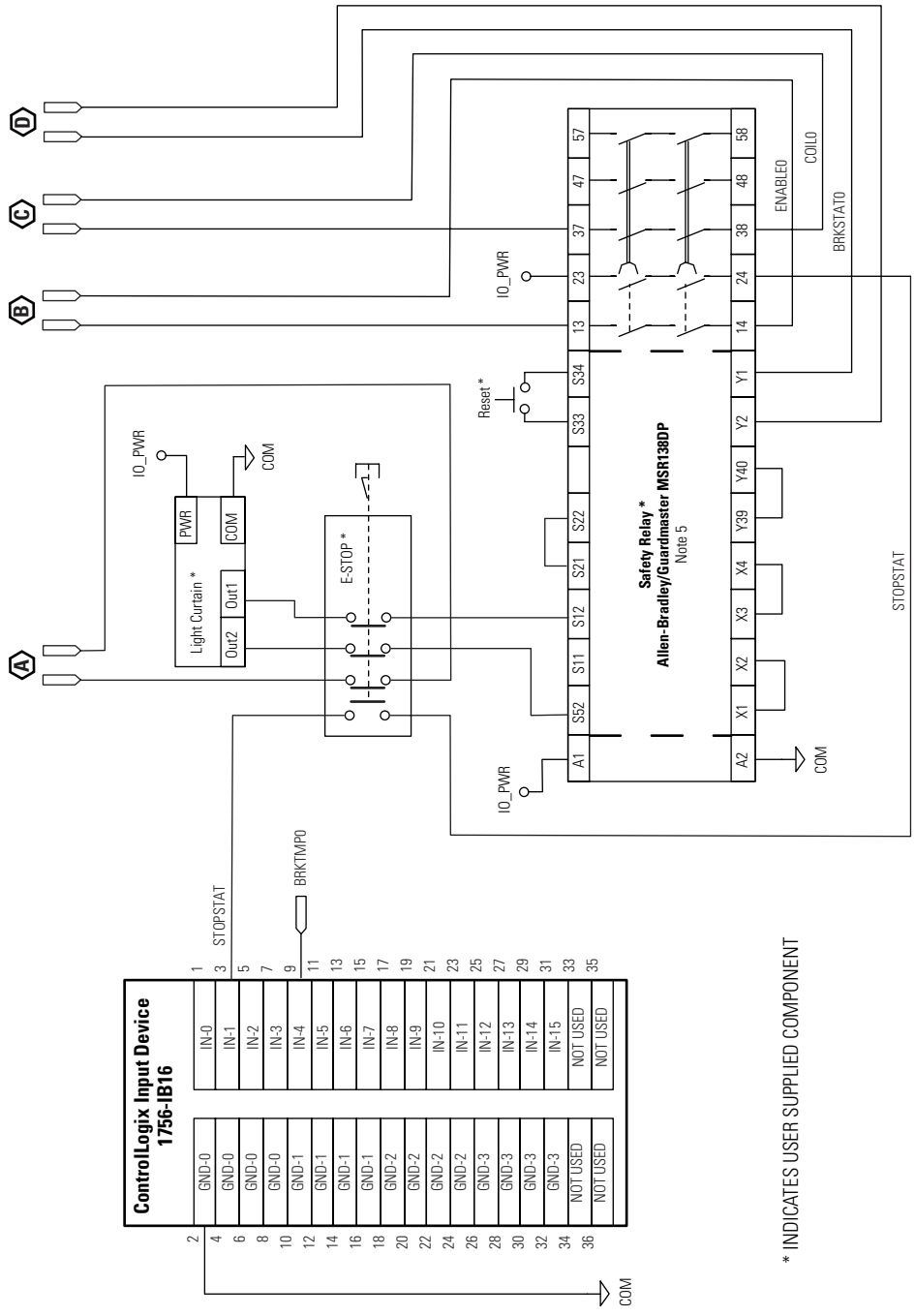



ControlLogix Input Device
1756-IB16
GND-0
IN-0
STOPSTAT
BRKTMP0
NOT USED
COM
Light Curtain *
PWR
Out1
Out2
COM
IO_PWR1
E-STOP *
Reset *
Safety Relay *
Allen-Bradley/Guardmaster MSR138DP
Note 5
A1
A2
S52
S11
S12
S21
S22
S33
S34
X1
X2
X3
X4
Y39
Y40
Y1
Y2
13
14
23
24
37
38
47
48
57
58
ENABLED
COIL0
BRKSTAT0
STOPSTAT
* INDICATES USER SUPPLIED COMPONENT

The example diagram below shows Kinetix 6000 IAM and LIM (2094-AL09 and -BL02) wired with the Bulletin 2090 RBM.

Figure C.4
Example RBM Interconnection Diagram (Category 3 Configuration per EN954-1)




ControlLogix Input Device
1756-IB16
GND-0
IN-0
IN-1
IN-2
IN-3
IN-4
IN-5
IN-6
IN-7
IN-8
IN-9
IN-10
IN-11
IN-12
IN-13
IN-14
IN-15
NOT USED
COM
STOPSTAT
BRKTMP0
Safety Relay *
Allen-Bradley/Guardmaster MSR138DP
Note 5
S52
S11
S12
S21
S22
S33
S34
A1
A2
X1
X2
X3
X4
Y39
Y40
Y2
Y1
13
14
23
24
37
38
47
48
57
58
IO_PWR
Reset *
E-STOP *
Light Curtain *
PWR
COM
Out1
Out2
ENABLED
COILO
BRKSTAT0
STOPSTAT
A
B
C
D
* INDICATES USER SUPPLIED COMPONENT

Set the RBM Delay Time Using DriveExplorer

In this procedure you will break SERCOS ring communications, set the delay time parameter using DriveExplorer software, and re-establish SERCOS communication.

If you are using this version of RSLogix 5000 software	Then
v11 or v12	Proceed with these instructions using DriveExplorer to set the RBM delay time parameter.
v13 or above	Go to *Configure Axis Properties* on page 1-24 and use RSLogix 5000 to set the RBM delay time parameter.

The following hardware and software tools are required to provide the necessary communication link between your PC and the Kinetix 6000 drive system running RSLogix 5000.

Description	Catalog Numbers	Version
DriveExplorer Software [1, 3]	9306-4EXP02ENE	2.01 or above
Serial to SCANport Adapter [2, 3]	1203-SSS (Series B)	3.004 or above
RSLogix 5000 Software	9324-RLD300NE	11.0 or 12.0
Personal computer with HyperTerminal	N/A	N/A

[1] Refer to *DriveExplorer Getting Results Manual* (publication 9306-GR001) for instructions.

[2] Refer to *1203-SSS (Series B) FRN 3.xxx User Manual* (publication 20COMM-UM001) for instructions.

[3] Additional information regarding these communication and software tools is available at **www.ab.com/support/abdrives**.

ATTENTION

To avoid personal injury or equipment damage, at least one end of a SERCOS fiber-optic cable must be disconnected from the drive. This ensures that motion will not occur while changes are made to the time delay parameter.

Remove SERCOS Communication

To remove (break) SERCOS communications:

1. Remove three-phase and control power from the Kinetix 6000 drive system.
2. Remove one of the SERCOS fiber-optic cables. Fiber-optic cable connections (Tx and Rx) are located on the top of each IAM/AM.
3. Re-apply three-phase and control power.

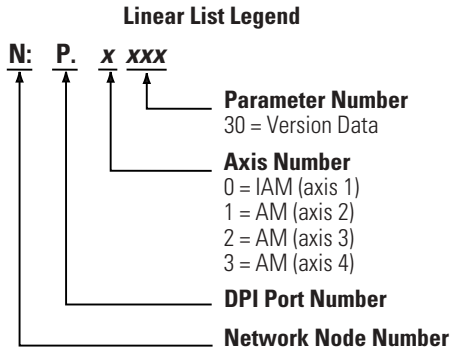
Set the RBM Delay Time Parameter

To set the RBM delay time parameter:

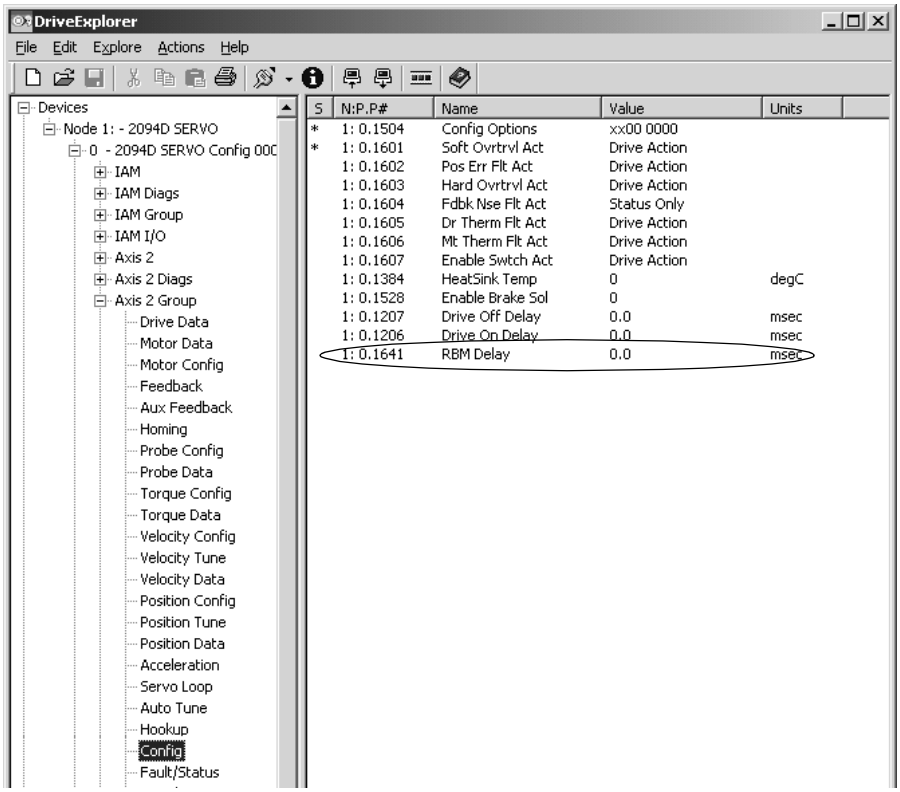
1. Start the DriveExplorer software.

2. Click on **Explore\Connect\Local** in the menu bar or enter **Ctrl-L** from the keyboard. DriveExplorer will read your system.

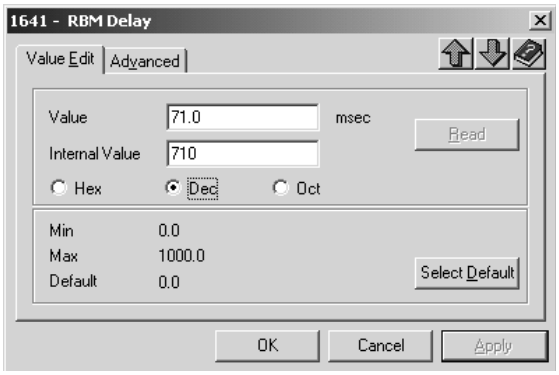
3. Observe the Linear List of parameters as grouped by Node, Port, and Axis hierarchy as shown below.



4. Click on **Devices\Node\Product\Axis *x* Group\Config** and navigate to the Config parameters as shown below.



5. Double-click on the *x:x:x*641 RBM Delay parameter. The command window for parameter *x*641 - RBM Delay opens.



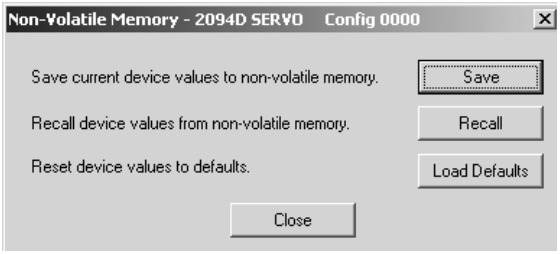
6. Click on the **Value Edit** tab and enter the delay time **Value** (ms). The recommended RBM delay time is 71 ms.

7. Select **OK**. The RBM delay time is changed, but not saved in non-volatile memory.

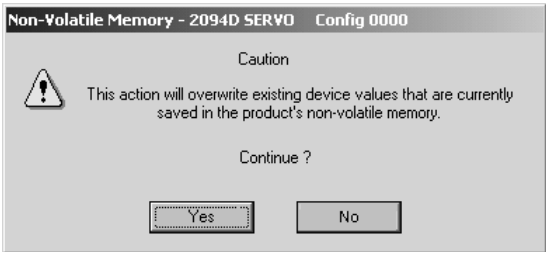
Save the Delay Time Parameter to Non-Volatile Memory

To save the delay time parameter to non-volatile memory:

1. Click on **Actions\Non-Volatile Memory** in the menu bar. The following message window opens.



2. Click on **Save**. The changes are saved to non-volatile memory and the following cautionary message window opens.



3. Click on **Yes** to complete saving changes to non-volatile memory. The following confirmation message window opens.

4. Click **OK**.

5.

If you	Then
Have another RBM in the Kinetix 6000 system	Go to *Set the RBM Delay Time Parameter* (step 4).
Do not have another RBM in the Kinetix 6000 system	1. Close DriveExplorer. 2. Go to *Reconnect SERCOS Communication*.

Reconnect SERCOS Communication

To reconnect SERCOS communication:

1. Remove three-phase and control power from the Kinetix 6000 drive system.

2. Replace the SERCOS fiber-optic cable(s) removed earlier. Fiber-optic cable connections (Tx and Rx) are located on the top of each IAM/AM.

3. Re-apply three-phase and control power.

DC Common Bus Applications

Chapter Objectives

This appendix provides integration procedures specific to the Kinetix 6000 multi-axis servo drive systems configured for DC common bus and using drive firmware v1.85 (or above). The procedure involves calculating capacitance values and setting the Add Bus Cap parameter using DriveExplorer software.

Before You Begin

These procedures assume you have mounted and wired your Kinetix 6000 DC common bus system. Refer to the *Kinetix 6000 Installation Manual* (publication 2094-IN001) for mounting and wiring information.

Before you set the Additional Bus Capacitance (Add Bus Cap) parameter in DriveExplorer, you need to calculate the following values using the tables provided:

- Total Bus Capacitance
- Additional Bus Capacitance

Calculate Total Bus Capacitance

Total bus capacitance is the sum of all capacitance values for your Kinetix 6000 common bus modules. Specifically, this includes the capacitance values for the following modules:

- Leader IAM (converter and inverter)
- Each AM and SM (if present) on the Leader IAM power rail
- Each Follower IAM (converter and inverter)
- Each AM on the Follower IAM power rails

Refer to *Kinetix 6000 Capacitance Values* on page D-3 for IAM/AM/SM capacitance values.

IMPORTANT When total bus capacitance exceeds the Leader IAM maximum value given in the table below, the IAM seven-segment LED displays error code E90 (pre-charge timeout fault) and the drive is disabled.

Leader IAM (230V) 2094-	**Maximum Bus Capacitance** µF	**Leader IAM (460V)** 2094-	**Maximum Bus Capacitance** µF
AC05-MP5	7145	BC01-MP5	4585
AC05-M01		BC01-M01	
AC09-M02	15295	BC02-M02	8955
AC16-M03	34400	BC04-M03	8955
AC32-M05	62825	BC07-M05	17915

IMPORTANT If your total bus capacitance value exceeds the value in the table above, you must increase the size of the Leader IAM or decrease the total bus capacitance by removing axis modules.

Calculate Additional Bus Capacitance

Additional bus capacitance is the sum of all Follower IAM and AM capacitance values for your Kinetix 6000 common bus modules. Specifically, this includes the capacitance values for the following modules:

- Each Follower IAM (converter and inverter)
- Each AM on the Follower IAM power rails

Enter the additional bus capacitance value in step 6 of *Set the Additional Bus Capacitance Parameter*.

Kinetix 6000 Capacitance Values

Use the tables below when calculating total bus capacitance and additional bus capacitance for your Kinetix 6000 common bus application.

IAM/AM (230V) Modules

IAM Converter (230V) 2094-	**Capacitance** µF
AC05-MP5	270
AC05-M01	
AC09-M02	540
AC16-M03	1320
AC32-M05	1980

AM Inverter (230V) 2094-	**Capacitance** µF
AMP5	390
AM01	660
AM02	780
AM03	1320
AM05	2640

IAM/AM (460V) Modules

IAM Converter (460V) 2094-	**Capacitance** µF
BC01-MP5	110
BC01-M01	
BC02-M02	220
BC04-M03	940
BC07-M05	1410

AM Inverter (460V) 2094-	**Capacitance** µF
BMP5	75
BM01	150
BM02	270
BM03	840
BM05	1175

SM (230/460V) Module

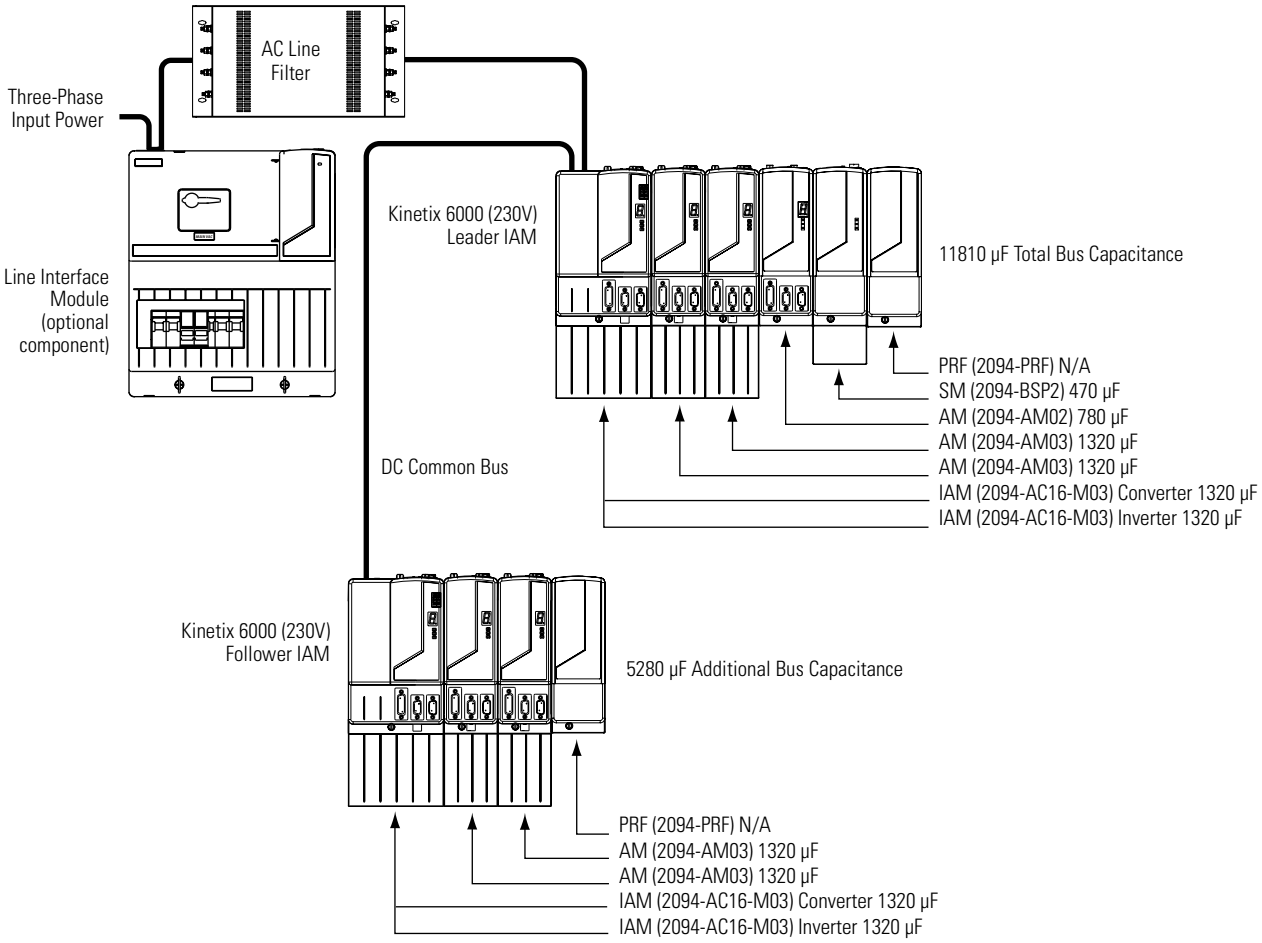
SM (230-460V) 2094-	**Capacitance** µF
BSP2	470

Common Bus Capacitance Example

In the figure below, the sum of the Leader IAM power rail modules capacitance (6530 µF) and the Follower IAM power rail modules capacitance (5280 µF) equals 11810 µF Total Bus Capacitance.

The sum of the Follower IAM power rail modules equal 5280 µF Additional Bus Capacitance.

Figure D.1
Calculating Common Bus Capacitance



Set the Additional Bus Capacitance Parameter

In this procedure you will set the Add Bus Cap parameter using DriveExplorer software.

The following hardware and software tools are required to provide the necessary communication link between your PC and the Kinetix 6000 drive system running DriveExplorer.

Description	Catalog Numbers	Version
DriveExplorer Software [1, 3]	9306-4EXP02ENE	2.01 or above
Serial to SCANport Adapter [2, 3]	1203-SSS (Series B)	3.004 or above
RSLogix 5000 Software	9324-RLD300NE	15.0 or above

[1] Refer to *DriveExplorer Getting Results Manual* (publication 9306-GR001) for instructions.

[2] Refer to *1203-SSS (Series B) FRN 3.xxx User Manual* (publication 20COMM-UM001) for instructions.

[3] Additional information regarding these communication and software tools is available at **www.ab.com/support/abdrives**.

ATTENTION

To avoid personal injury or equipment damage, at least one end of a SERCOS fiber-optic cable must be disconnected from the drive. This ensures that motion will not occur while changes are made to the Add Bus Cap parameter.

Remove SERCOS Communication

To remove (break) SERCOS communications:

1. Remove three-phase and control power from the Kinetix 6000 drive system.
2. Remove one of the SERCOS fiber-optic cables. Fiber-optic cable connections (Tx and Rx) are located on the top of each IAM/AM.
3. Re-apply three-phase and control power.

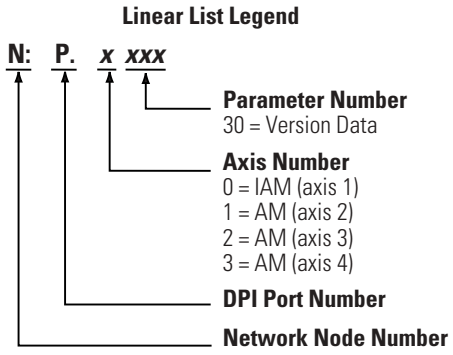
Set the Additional Bus Capacitance Parameter

To set the Additional Bus Capacitance parameter:

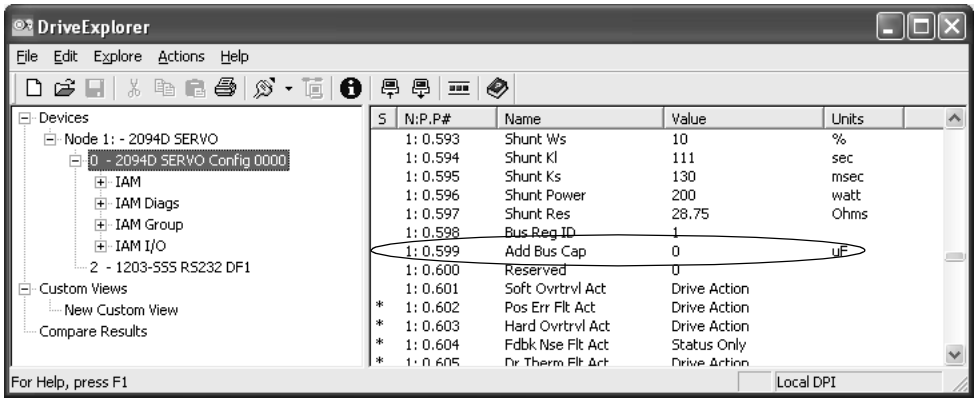
1. Start the DriveExplorer software.

2. Click on **Explore\Connect\Local** in the menu bar or enter **Ctrl-L** from the keyboard. DriveExplorer will read your system.

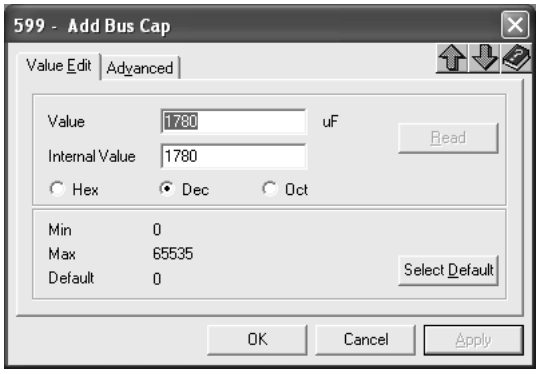
3. Observe the Linear List of parameters as grouped by Node, Port, and Axis hierarchy as shown below.



4. Click on **Devices\Node\Product** and navigate to the parameter *x:x:x*599 as shown below.



5. Double-click on the *x:x:x*599 Add Bus Cap parameter. The command window for parameter *x*599 - Add Bus Cap opens.



6. Click on the **Value Edit** tab and enter the Add Bus Cap **Value** (µF).

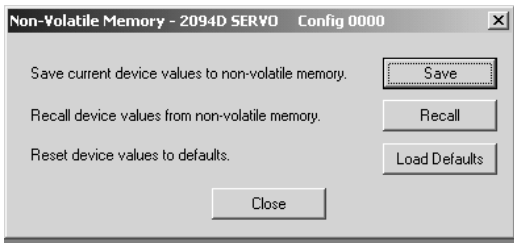
7. Select **OK**. The Add Bus Cap parameter is changed, but not saved in non-volatile memory.

8. Go to *Save the Add Bus Cap Parameter to Non-Volatile Memory*.

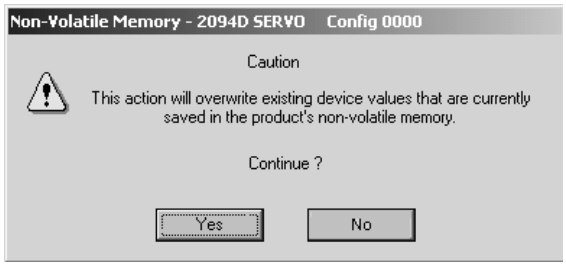
Save the Add Bus Cap Parameter to Non-Volatile Memory

To save the Add Bus Cap parameter to non-volatile memory:

1. Click on **Actions\Non-Volatile Memory** in the menu bar. The following message window opens.



2. Click on **Save**. The changes are saved to non-volatile memory and the following cautionary message window opens.



3. Click on **Yes** to complete saving changes to non-volatile memory. The following confirmation message window opens.

4. Click **OK**. Close DriveExplorer.

5. Go to *Reconnect SERCOS Communication*.

Reconnect SERCOS Communication

To reconnect SERCOS communication:

1. Remove three-phase and control power from the Kinetix 6000 drive system.

2. Replace the SERCOS fiber-optic cable(s) removed earlier. Fiber-optic cable connections (Tx and Rx) are located on the top of each IAM/AM.

3. Re-apply three-phase and control power.

Numerics

A

B

C

D

E

F

G

H

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K

L

M

T

U

W

X

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using its products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

www.rockwellautomation.com

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